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Cocaine Babies: The Scourge of the '90s

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ABSTRACT: Six cases of cocaine-related deaths of infants have covered the spectrum of potentially devastating effects. They include an intrauterine death of a 35-week-old fetus following acute maternal cocaine abuse; anoxic encephalopathy at birth with 3 months' vegetative survival from a similar episode; traumatic compression asphyxia in a 4-month-old; infectious cardiomyopathy with heart failure in a twin at age 21 months following maternal cocaine abuse at birth; malnutrition and dehydration in a 7-week-old during continuing cocaine abuse by the parents; and a teenage sibling's cocaine lacing of a baby milk bottle ingested by his 6-week-old brother. All the cases had positive toxicological screening for cocaine or metabolites or both in the mother at delivery or in the infant at birth, or both. There were no instances of sudden infant death syndrome (SIDS, or "crib death"). Pathologic and toxicologic, as well as birth, developmental, and social data are presented.

An integrated medical, public health, law enforcement, and educational policy to prevent or at least ameliorate these tragic cases, now approaching epidemic proportions, has yet to be developed. A careful obstetrical history and examination of the mother, indication on the birth certificate of maternal drug abuse, and notification of health authorities (by birth certificate checking, among other ways) may send an early warning message to providers for intercession. Active ingestion/injection and passive inhalation by older children and teenagers require more intensive monitoring and aggressive interaction by pediatricians, social workers, school authorities, and employers. Postmortem toxicologic analysis for cocaine and other drugs in each fetus, infant, and child has now become essential, given the frequency of positivity in obstetrical and other clinical situations and recent forensic reports.

KEYWORDS: toxicology, symposium, cocaine, infants, maternal drug abuse, fatalities

During the past few years, the problems of cocaine intoxication and addiction have found their way to pregnant women and have now been shown to affect their offspring adversely [1]. Such recognized changes as respiratory pattern abnormalities and congenital urogenital pathologic changes have recently been described [2-4]. Other studies have shown that maternal cocaine abuse results in lower gestational age at delivery, an increase in preterm labor and delivery, lower birth weights, and delivery of small-for-gestational-age infants [5]. Larger, more recent studies have discovered similar abnormalities in mothers and their offspring as well as congenital cardiac anomalies [6-8].

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Cases have now begun to come under the jurisdiction of the medical examiner in which infants have had toxic exposure during maternal cocaine intoxication and have succumbed in utero, have been severely damaged at birth, or have been placed in other risk categories—including homicide—as developing babies. The first cases of infants to die with cocaine in their systems, however, seem to have been unsuspected [9,10].

A series of six cases have been compiled over the past 3 years at the Rhode Island Medical Examiner's Office and constitute the substance of this report. All cases have positive toxicologic confirmation of cocaine or metabolites or both in the mother's or baby's urine, or both, at birth. They represent the spectrum of changes from a developing fetus in utero to young infants past the first year of life.

Cases

Case 1

FT was a female fetus of 35-weeks gestational age who died as a result of cocaine intoxication secondary to maternal cocaine abuse. The mother is a 26-year-old single woman with a history of seven pregnancies resulting in births to three live children. One pregnancy ended in induced abortion and one pregnancy was categorized by hydatiform mole. The patient had had no menstrual periods since her previous pregnancy of approximately 13 months prior to this stillbirth. Her blood pressure had been normal with a 13-lb (5.9 kg) weight gain. No history of sexually transmitted disease was noted. She had used cocaine for 4 years and also admitted to using ethyl alcohol and marijuana. There also is a history of asthma. One nephew has muscular dystrophy. When presenting to the hospital, she had a sudden onset of vaginal fluid leakage with no uterine contractions. She was noted to be under the influence of cocaine. The fetal heartbeat was irregular. Scattered wheezes bilaterally were noted, and the mother had a white blood cell count of 9500 mm³. She had no evidence of antibodies and was given an injection of Rh immunoglobulin and discharged after 1 day.

She was admitted 3 days later, having observed no fetal movement for the past two days. An ultrasound examination confirmed no fetal heart movement. Labor was induced, the membranes were artificially ruptured, and the stillborn infant was delivered. Laboratory data on the mother on this admission were negative for sexually transmitted diseases. The fetus showed extensive maceration and autolysis, with no evidence of infection. There was an incidental finding of atrial-septal defect, secundum type. The placenta was pale. Histologic examination revealed extensive autolysis. A few aspirated squames were noted in the alveoli. Pigmented macrophages, presumably representing meconium, were present in the fetal membranes. Toxicology revealed blood cocaine concentrations of 0.3 µg/mL and 1.12 µg/mL of benzoylecgonine. The urine revealed 0.40 µg/mL of cocaine and 1.21 µg/mL of benzoylecgonine. The liver showed 0.14 µg/mg of cocaine and 0.38 µg/mg of benzoylecgonine. No other drugs were detected.

Case 2

VK was a 3½-month-old white female who died from bilateral aspiration pneumonia due to perinatal asphyxia with multicystic encephalopathy due to acute and chronic maternal intravenous cocaine abuse. Intrauterine growth retardation was noted. The child was a 1520-g product of a 36-week gestation born to a 22-year-old prima gravida mother with a history of intravenous (IV) cocaine abuse during pregnancy. The mother apparently used cocaine on the night prior to delivery and had presented to an out-of-state city hospital in labor. Fetal distress of the infant was noted; she was delivered by stat C-section with evidence of meconium aspiration. It was a breech presentation with

a nuchal cord. The Apgar ratings were 2, 4, and 6 at 1, 5, and 10 min, respectively. The placenta was small and immature, weighing 217 g, and was meconium stained. Microscopically it showed mild acute chorioamnionitis, deciduitis and focal decidual vascular thickening, decidual necrosis, and diffuse chorangiomas. The infant's urine screen was positive for cocaine metabolites. Neonatal abstinence syndrome developed, and she received tincture of opium and was weaned at 1 month of age. She then developed tonic-clonic seizures with lip smacking and was placed on phenobarbital. The infant remained in a special-care nursery for 2 months, requiring oxygen that was weaned to room air at 1 day. Multicystic leukomalacia was noted on ultrasound and computed tomography (CT) scan. Her seizures persisted, requiring Dilantin therapy. Respiratory disease ensued and she was treated with Erythromycin for presumptive Chlamydia pneumonia and conjunctivitis because of her mother's positive culture. Chest X-ray revealed interstitial lung disease; she had wheezing, which responded to Alupent. The barium swallow test was negative for gastroesophageal reflux.

She was transferred to Rhode Island Hospital because her mother consented to give custody to the infant's grandmother, who lived in Rhode Island. She remained hospitalized for another 1½ months and had further problems with her airway disease and was treated with theophylline and Alupent. Gavage feeding was required because of aspiration and swallowing problems. The hepatitis B screen was negative. Gastroesophageal reflux was documented and she had diarrhea due to rotavirus, which was resolving at the time of her death. She did gain weight, and discharge to a long-term care facility was contemplated.

She had a coughing spasm during a subsequent feeding episode and was re-fed by a nasogastric tube, and projectile vomiting ensued. The coughing worsened, cyanosis ensued, and cardiopulmonary resuscitation (CPR) was begun; resuscitation was to no avail and she was pronounced dead one-half hour later. The autopsy revealed clear mucus in the upper airway with tan plugs consistent with formula in the distal bronchi. Ongoing acute and chronic aspiration pneumonia was noted, and the gastroesophageal junction was histologically consistent with reflux. Other lung areas were suggestive of asthma; this diagnosis, not usually entertained in an infant, perhaps represented reaction to the ongoing aspiration. No evidence of viral infection was noted; human immunodeficiency virus (HIV) results were negative. Her height, weight, and head circumference were below the fifth percentile. Neuropathology examination showed severe multicystic encephalopathy, suggesting circulatory insufficiency through terminal major cerebral vessels. Cultures of blood and cerebrospinal fluid (CSF) were sterile, but the left lung grew *Streptococcus* and the right lung *Escherichia coli*.

Case 3

TY was a 7-week-old Mulatto male who was found dead by his parents near the foot of their bed when they had awakened from their sleep, allegedly induced by drugs, including cocaine. The baby was found sitting in a rolling baby chair with soiled clothing and a markedly depressed anterior fontanel, indicative of severe dehydration. Two other siblings were present in the house, 3 and 5 years old, and appeared normal. Examination of the body revealed a severely dehydrated and malnourished child weighing 3314 g, in comparison with his birth weight of 2835 g. Although he was near the 25th percentile at birth in height, weight, and head circumference, he was in less than the 5th percentile in all measurements at death. Both mother and baby were positive for cocaine at birth. Other findings included a severe diaper rash over both buttocks and thighs, showing necrosis and ulceration. Panniculus adiposus was absent. There was no sign of significant organic, infectious, or congenital disease. Although watery fluid was pronounced in the gastrointestinal tract, there were no fistulous tracts, pyloric stenosis, polyps, diverticula,

infection, or other abnormalities; no formed stool was present in the lower intestinal tract. The remaining tissues showed no obvious edematous change. There was no evidence of gross or microscopic enterocolitis. Postmortem bacteriologic, toxicologic, and histologic study results were within normal limits, except for the skin pathology from the diaper rash. Postmortem vitreous chemistry revealed a urea nitrogen of 52 mg/dL, sodium of 117 meq/L, and chloride of 113 meq/L. In the CSF, the urea was 68 mg/dL, sodium 118 meq/L, and chloride 101 meq/L. Toxicologic studies revealed ethyl alcohol and phenethylamine in the liver, which is consistent with putrefactive changes. No cocaine was discovered in the baby's tissues or in the milk bottle. The case was certified as dehydration and malnutrition from starvation and neglect and classified as a homicide. The maternal cocaine abuse and diaper rash were listed as other significant conditions.

Case 4

DM was a 6-week-old white male. This infant was found unresponsive in his crib at home by his mother, with his face down and his head covered by a blanket. He was last seen several hours earlier at his last feeding. He was transported to the hospital emergency room arriving cold (temperature 87°F [30.6°C]), mottled, and stiff. He was born to a 37-year-old gravida 4, para 3, ab 1 mother at 36 weeks' gestation by C-section for failure to progress in labor. A right hydrocele was noted but otherwise no findings or complaints.

On arrival at the emergency room, the infant's 15-year-old stepbrother was locked up for assaulting his mother; this teenager was brought to Family Court the next day, and the Judge released him. Upon investigation, it was suspected that the boy may have tampered with the baby bottle or the formula, or both, prior to the mother's feeding the child.

The autopsy revealed a slight amount of curd-like mucoid material in the stomach, approximating 5 cc. There was no evidence of aspiration, infection, congenital abnormalities, or petechial hemorrhages. The baby was 22.5 in. (57 cm) (50th percentile) and 4225 g (25th percentile). Toxicology revealed a cocaine concentration of 0.08 µg/mL in the blood with no benzoylecgonine. The urine showed 0.19 µg/mL of cocaine and 1.17 µg/mL of benzoylecgonine. The gastric contents showed 0.24 µg/mL of cocaine and 0.08 µg/mL of benzoylecgonine. The CSF showed 0.08 µg/mL of cocaine and 0.05 µg/mL of benzoylecgonine. Analysis of the baby bottle (130 mL) showed 0.43 µg/mL of cocaine and 0.10 µg/mL of benzoylecgonine. The small quantity in the bottle may have been the result of heating, refilling, room temperature deterioration, or some combination of these. This has not been clarified. The case was certified as an acute cocaine intoxication resulting from ingesting probable cocaine-laden baby formula and classified as a homicide.

Case 5

TC was a 4-month-old black female who died as a result of traumatic compression asphyxia. She was found unresponsive in a motel room wedged between her father's body and the back of a couch. The baby's mother and a friend had left the motel to do errands and left the baby in the care of her father and another couple. The baby was placed on her back and "everyone fell asleep." When the woman woke up 2½ to 3 h later, she found the baby lying face down with her head turned at an angle so that the "left side of the face was down on the cushion and the right side was pressed into the back of the couch." She also stated that "the area was wet where the baby's head was located." The rescue service transported the baby to the hospital, and she was noted to be in rigor mortis. The baby was a 5-lb, 6-oz (2.44-kg) product of a 37-week pregnancy to a 26-year-old gravida 5 mother. The spontaneous vaginal delivery was unattended due to very rapid labor. The Apgars were 9 and 9 at 1 and 5 min, respectively. The pregnancy

was notable for heavy cocaine use by the mother, including on the day of delivery, when the baby's urine was also positive for cocaine metabolites. No perinatal complications were present and the baby was discharged at 3 days of age. She was seen by a pediatrician at the age of 3 weeks and received her first set of immunizations. Four other siblings are in apparent good health. The autopsy showed a small but well-developed infant with a height, weight, and head circumference in the 10th percentile. There were no petechial hemorrhages of the conjunctivae. Focal small abrasions of the knees were the only injuries seen. There was severe congestion of the lungs, with hemorrhagic pulmonary edema with airway froth. Petechial hemorrhages of the pleurae, epicardium, and thymus were noted, but none of the epiglottis. Histologic examination revealed reflux esophagitis and mild subacute otitis media. Cytology was performed on stains on the pillow where the baby's head was located, and rare single cells of probable columnar respiratory epithelium were identified. Neuropathologic study results were unremarkable. Cultures of both lungs grew *Candida pseudotropicalis*, considered a contaminant. Cultures of blood and CSF were negative. HIV was negative. Vitreous chemistry and hemoglobin electrophoresis were normal. Toxicologic studies were negative for drugs and alcohol.

Case 6

HM was a 21-month-old white female who was an identical twin born at a local hospital, and whose mother was a known cocaine and heroin addict. A subsequent child had also been born during maternal cocaine abuse. Each twin was placed in a separate foster home under the supervision of the Department of Children and Families. This child was seen in multiple emergency rooms over several months for a diagnosis of upper respiratory infection, and antibiotics had been prescribed. At the time of the sudden death of this child, a diagnosis of upper respiratory infection and otitis with successful treatment had been instituted in a local hospital on the other twin. Examination of the other twin's organ systems, including the cardiac, were said to be "within normal limits." The other twin was subsequently discharged in good health.

Autopsy revealed significant cardiomegaly (120 g), mild endocardial fibrosis, but no evidence of congenital or acquired valvular or vascular abnormalities. There was bilateral hydrothorax, (125 cc left, 75 cc right), and ascites (200 cc). The liver appeared diffusely fatty and was enlarged (398 g). Microscopic evidence showed both acute and subacute myocarditis but no evidence of necrosis, giant cell formation, or other microscopic abnormalities. There was no evidence of old or recent infection in other organs and tissues. Aspiration was not observed, and other findings included only terminal medical attention given at two hospitals shortly before death. HIV was negative. Neuropathology studies were within normal limits. Chemical studies showed no renal failure or carbohydrate intolerance. Blood cultures were sterile for bacteria, but viral cultures were not performed. Toxicologic studies were negative. The case was certified as infectious cardiomyopathy and classified as natural causes.

Discussion

The variety of tragic cases within this group of infants makes it imperative that a full toxicologic screen be performed on all stillbirths, newborns, young infants, and older children that come to the attention of the medical examiner. Indeed, many are first discovered inadvertently when such testing may be ordered for entirely different reasons.

Serious attention must also be paid to families where such an ominous danger as drug abuse can easily compromise a young infant. Aggressive, intensive monitoring of young children by various professionals will be required to, at least, recognize the extent of the problem and help pose some rational solutions. More rigid identification and interaction

by medical, social, and educational groups seem inevitable if the present epidemic is to be ameliorated.

Some maternity hospitals now report that up to 40% of their mothers screen positive for drugs of abuse upon admission. An increased incidence of abruptio placenta augers poorly for these women and their newborns. Death of mothers, however, are apparently rare even in larger metropolitan areas.

Some data indicating lack of attention span and other subtle abnormalities have been documented in two- and three-year-olds. Long-term effects of maternal cocaine abuse on the growth and development of older children are being studied at present. In an effort to document more fully the potential dangers in such cases, tracking by means of birth certificate data regarding maternal drug abuse has been attempted.

Preliminary data from our office and other supportive information indicate that sudden and unexpected infant deaths (SIDS) are not increased for drug-abusing mothers [11]. Some deaths following withdrawal symptoms, however, which are present at birth, do occur in the very young infant in the first year of life.

Our cases indicate that a careful obstetrical history and urine testing prior to and at birth is essential. All fetuses, infants, and children should be tested for cocaine and other drugs at autopsy examination. Environmental (scene) investigation is a crucial component of a total workup, and drug intoxication by passive inhalation as well as baby food and liquid (milk or formula) should be considered.

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