FETAL MECONIUM PERITONITIS ASSOCIATED WITH PRENATAL METHAMPHETAMINE EXPOSURE

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SUMMARY

Objective: In roughly 50% of all patients with meconium peritonitis, there is no evidence of primary obstruction of the bowel. We report a case of maternal methamphetamine and heroin abuse complicated by fetal meconium pseudocyst without a definite intestinal obstructive lesion. We discuss the correlation between the presence of meconium peritonitis and prenatal exposure to methamphetamine.

Case Report: A 19-year-old, gravida 2, para 0, abortus 1, woman had abused illegal drugs, including methamphetamine and intravenous heroin. Suffering from withdrawal symptoms, she was taken to a shelter where she was diagnosed with a pregnancy of 26 weeks' gestation. The patient underwent cesarean section at 34 weeks due to preterm labor and fetal malpresentation. A boy weighing 2,474 g was born, but had to be intubated and admitted to the intensive care unit because of a distended abdomen and respiratory distress. A laparotomy performed on the second day of life revealed a large calcified pseudocyst associated with two perforations of the distal jejunum. A segmental resection of the jejunum with primary anastomosis was performed. The infant recovered well after the operation and was discharged 65 days after birth.

Conclusion: Since methamphetamine is a powerful α-adrenergic stimulant and induces the release of catecholamines from adrenergic synapses, it can cause powerful vessel constriction. Prenatal exposure to methamphetamine can cause disruption of mesenteric blood flow with transmural necrosis of the bowel, resulting in bowel perforation and meconium peritonitis. [Taiwanese J Obstet Gynecol 2005;44(2):180–182]

Key Words: meconium peritonitis, methamphetamine

Introduction

Meconium peritonitis is defined as a sterile reaction in the fetal abdomen resulting from intrauterine bowel perforation. It occurs in one in every 35,000 live births [1]. The intense inflammatory reaction forms a dense, adherent membrane that effectively seals off the intestine at the site of perforation. If, however, the perforation is not totally sealed, a thick-walled cystic cavity forms, and meconium will continue to enter this cystic space. The meconium cyst may entrap or compress the surrounding intestines [2,3]. The association of meconium peritonitis with maternal prenatal cocaine abuse has been reported in the literature, with the authors attributing it to the vascular effects of cocaine [4]. Amphetamines, a group of sympathomimetic drugs, have pharmacologic effects similar to cocaine. Members of this group include amphetamine, dextroamphetamine and methamphetamine. They are powerful α-adrenergic stimulants and induce the release of catecholamines from adrenergic synapses [5].

Here, we report a case of meconium pseudocyst in a baby whose mother abused methamphetamine and heroin during pregnancy. The possible relationship between drug effects and meconium peritonitis is discussed.
Case Report

A 19-year-old, gravida 2, para 0, abortus 1, woman had abused illegal drugs, including methamphetamine (by inhalation for 6–7 years) and heroin (injected intravenously in the previous 6 months). Suffering from withdrawal symptoms, she was taken to a shelter where she was diagnosed with a pregnancy of 26 weeks’ gestation. She presented for prenatal care at 28 weeks; ultrasound showed a fetus with biometric data appropriate for gestational age. However, polyhydramnios and fetal ascites with a large echogenic cyst (7.23 x 3.26 cm) in the left upper abdominal cavity were present (Figure). Amniocentesis revealed a 46XY karyotype. The mother’s urinary methamphetamine concentration was 788 ng/mL, with opiate metabolites of 448 ng/mL.

The patient underwent cesarean section at 34 weeks due to preterm labor and fetal malpresentation. A boy weighing 2,474 g was born, with Apgar scores of 5 and 9 at 1 and 5 minutes, respectively. The baby was intubated and admitted to the intensive care unit because of a distended abdomen and respiratory distress. A laparotomy performed on the second day of life revealed a large calcified pseudocyst associated with two perforations of the distal jejunum. A segmental resection of the jejunum with primary anastomosis was performed. The infant recovered well after the operation and was discharged 65 days after birth.

Discussion

Meconium peritonitis is the result of an intrauterine perforation of the small bowel or, rarely, other sites of the gastrointestinal tract [2,3]. It may occur as early as 24 weeks of gestation [6]. In 50% of cases, a definite obstructive lesion can be demonstrated, the most common being volvulus, atresia, intussusception, vascular insufficiency, duplication, stenosis, congenital bands, cystic fibrosis, meconium plugs, imperforate anus, Meckel’s diverticulum, hyperplastic lymphoid tissue and colonic aganglionosis [2,7]. In addition, bowel ischemia secondary to prenatal anoxic events may cause perforation with subsequent meconium peritonitis [8,9].

Lloyd suggested that intestinal perforation is associated with diminished mesenteric blood flow due to perinatal asphyxia [10]. Tibboel et al hypothesized that a temporary reduction in mesenteric blood flow may lead to necrosis of the mucosa, which may in turn cause complete obstruction of the intestinal lumen, resulting in atresia of the small bowel [11]. Persistent reduction of mesenteric blood flow can lead to transmural bowel necrosis. Depending on the rate of this process, perforation may occur, resulting in meconium peritonitis without intestinal atresia [11].

Amphetamine is a phenylisopropylamine and is structurally similar to endogenous catecholamines and neurotransmitters. It is a powerful α-adrenergic stimulant that induces the release of catecholamines from adrenergic synapses, which are then primarily responsible for the peripheral actions of the drug. Maternal use of amphetamines during pregnancy carries a significant risk of intrauterine growth retardation and premature delivery [12]. Methamphetamine is very similar to amphetamine, but has a higher ratio of central to peripheral effects [5]. In near-term pregnant sheep given intravenous amphetamine at or below commonly used recreational doses, methamphetamine rapidly crossed the placenta and accumulated in the fetus [13,14]. Fetal ovine blood pressure increased 20–37% with a decrease in fetal oxyhemoglobin saturation and arterial pH. Methamphetamine has pharmacologic effects similar to cocaine, including vasoconstriction and infarction [15]. Cocaine, a potent vasoconstrictor, is strongly suspected to be a teratogen. Maternal cocaine administration may impose notorious effects on the developing fetus via cocaine-induced maternal uterine hypoperfusion and hypoxemia [16], and direct cocaine-mediated vasospasm, hypertension, and tachycardia with subsequent microregional infarction [17]. This could lead to loss of an existing structure, or stricture of that structure; utero-intracranial vascular accidents, transverse limb defects, and necrotizing enterocolitis following cocaine exposure support such a mechanism [4,18,19].

Fetuses exposed to cocaine have exhibited various disruptive pathogenic vascular anomalies, including complex choroid cysts, gastroschisis, meconium peri-
tonitis, urethral stenosis, and radial hypoplasia [4, 20]. Similarly, cerebral injuries occurring in newborns exposed to methamphetamine or cocaine in utero appear to be directly related to the vasoconstrictive properties of those drugs [21]. Retrospective human studies and case reports have linked amphetamines to congenital heart disease, biliary atresia, and limb reduction [22, 23]. All of these manifestations are related to disruption of the circulation and vasculogenesis during embryogenesis [22].

In general, the frequency of congenital anomalies is not higher among infants born to mothers addicted to heroin, but there is a significantly higher rate of morbidity, including preterm labor, fetal growth restriction, and prenatal death [24]. Women who used heroin during pregnancy tended also to use other substances (tobacco, cocaine, etc.) more often than did controls [24]. In our case, we believe that meconium peritonitis most likely occurred because of methamphetamine-induced mesenteric vasoconstriction leading to bowel ischemia and perforation. However, the exact risk of it occurring in an individual methamphetamine-exposed pregnancy remains unknown. Large cohort studies may be necessary to define this risk further.

References