PART ONE

Maternal Conditions and Diseases

CIGARETTE SMOKING, MATERNAL

J.M. LORENZ, MD

HISTORY & PHYSICAL

Neonatal and fetal effects

- Spontaneous abortion
- Premature labor
- IUGR (avg wt reduction of 200 g per pack per day)
- Placental abruption
- 2-fold increase in cleft lip/palate

TESTS

- Nonspecific
  - ➢ As indicated for prematurity, IUGR
- Specific
  - ➢ Exposure can be quantitated by serum cotinine concentration; not clinically indicated

DIFFERENTIAL DIAGNOSIS

N/A

MANAGEMENT

- Supportive for prematurity, IUGR (see **INTRAUTERINE GROWTH RETARDATION**)
- Avoid passive smoking exposure postnatally.

SPECIFIC THERAPY

- None

FOLLOW-UP

- Usual well child

COMPLICATIONS AND PROGNOSIS

- Complications
  - ➢ Related to prematurity, IUGR
- Prognosis
  - ➢ 2-fold increased risk of SIDS
  - ➢ Increased prevalence of asthma w/ passive smoke exposure

COCAINE ABUSE, MATERNAL

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EFFECTS OF COCAINE

- Vasoconstriction
- Decreased cholinesterase activity
- Increased nor-epi, serotonin & dopamine levels

HISTORY & PHYSICAL

- Prevalence: 1–15% pregnant women
- Maternal risk factors
  - H/o of prior drug abuse
  - Tobacco, ethanol, other illicit substance use
  - <3 prenatal care visits
  - Low socioeconomic status
  - Greater number of pregnancies & abortions
  - Poor nutrition
  - H/o STD; HIV
  - H/o prostitution
  - H/o dysfunctional family life
  - H/o domestic abuse
  - H/o psychiatric illness
  - Unemployment
  - H/o freq relocation, homelessness, living in shelters, encounters w/law enforcement
- Maternal hx
  - Sensitivity of ***routine*** prenatal interview for h/o substance abuse is as low as 25%.
  - ***Structured*** interviews (impractical for clinical use), ***repeated*** throughout pregnancy, for h/o cocaine use detect ~65% of cases.

Fetal/Neonatal Effects

- Effects related to dose, time, length of exposure
- Tobacco, alcohol, other illicit drug use & poor prenatal care contribute to effects
- Spontaneous abortion (25–40%)
- Stillbirth (5–10× increase)
- Premature rupture of membranes (2–5× increase)

- Chorioamnionitis
- Placental abruption
- Pre-eclampsia/eclampsia
- Fetal distress, asphyxia
- Meconium-stained amniotic fluid (2× increase)
- Premature birth (20–25%); on avg, assoc w/ 2-wk decrease in GA)
- IUGR (2–5× increase; mean decrease in wt 400 g, length 2 cm, OFC 2 cm)
- Other uncommon, anecdotal findings described:
  - Vascular disruption syndrome: limb reduction defects, intestinal atresias
  - CNS abnormalities: infarcts, cysts, hemorrhages due to perinatal cerebrovascular accidents
  - Congenital anomalies: GU (hypospadias), cardiac, ocular

Signs in newborn/fetus

- None distinctive
- Prematurity
- Low birth wt
- Microcephaly
- Low Apgar scores due to asphyxia
- Signs [due to pharmacologic effect on developing fetus, neonate (cocaine intoxication) or withdrawal?]
  - Irritability, tremors, hypertonia, posture & movement abnormalities (25%)
  - Lethargy
  - On NBAS: Poor state regulation, increased stress response & hyperactivity
- Tachycardia, hypertension
- Apnea, seizures, lethargy, hypotonia w/ cerebrovascular accident
- Bilious emesis, abd distention w/ intestinal atresia

TESTS

- Nonspecific
  - Screen for STDs, if not prev performed
  - Screen for other illicit drug use
  - As indicated for prematurity, IUGR, asphyxia
  - As necessary to r/o other etiologies for above signs: neonatal narcotic withdrawal, maternal amphetamine use, CNS hemorrhage, hyperthyroidism

- ➢ Head US/MRI
- ➢ Abnl EEG: CNS irritability w/ bursts of sharp waves, spikes for as long as 6–12 mo
- ➢ Abnl BAER: increased interwave intervals
- ➢ Abnl visual evoked potentials
- ➢ Renal US as indicated
- ➢ Echocardiogram, EKG as indicated
- ➢ GI contrast studies as indicated

- Specific – Drug screening for cocaine metabolites – screening (lower specificity/higher sensitivity, e.g. immunoassay) AND different confirmatory testing (high sensitivity/higher specificity, e.g. gas chromatography/mass spectroscopy) recommended
  - ➢ Maternal urine
    - Window of detection ~24–72 hr (depends on dose); high false-negative rate
    - **Skilled maternal interview & maternal urine toxicology increase detection over either alone.**
  - ➢ Neonatal
    - Urine (specimen collected ASAP after birth) – detects only recent exposure; high false-negative rate
    - Meconium (collected in first 2 days of life)
      - Preferred screening method
      - Sensitivity ~90%, specificity 100% for maternal 2nd- or 3rd-trimester use compared to repeated, structured maternal interview; allowing sample to stand at room temp >12–24 hr decreases sensitivity

DIFFERENTIAL DIAGNOSIS

- Other causes of IUGR (see **INTRAUTERINE GROWTH RESTRICTION**)
- Other causes of irritability (e.g., neonatal narcotic withdrawal, CNS anomalies, hyperthyroidism)
- Other causes of stroke (see **STROKE, ISCHEMIC, PERINATAL AND NEONATAL**)
- Other causes of microcephaly
- Other causes of hypertension (see **HYPERTENSION**)

MANAGEMENT

- Careful interview re h/o tobacco, alcohol, other illicit drug use
- Supportive care for complications assoc w/ prematurity, growth restriction, asphyxia, other complications

- Breastfeeding contraindicated unless cessation of use documented
- Social service consultation

SPECIFIC THERAPY

- None

FOLLOW-UP

- Neurodevelopmental

COMPLICATIONS AND PROGNOSIS

- Complications
  - Related to dose & length of exposure & other drug use
  - Boys seem to be more vulnerable.
  - Related to prematurity, IUGR, asphyxia
  - Related to cerebrovascular accident
  - Intestinal atresia
  - Transmission of associated STD, HIV to fetus/neonate
- Prognosis – related to interaction of the pharmacologic effects of the drug & the high-risk environment associated with the drug culture & poverty, including disorganization, dysfunctional families, poor maternal-infant interaction & nurturing
  - Catch-up growth within 1–2 mo
  - ? increased risk of SIDS
  - Hypertension as long as 18 mo
  - Hypertonicity as long as 18 mo
  - Persistence of primitive reflexes & tremors up to 24 mo
  - Persistence of abnormal arousal response; greater reactivity & state changes
  - Deficits in gross & fine motor development: balance, hand-eye coordination
  - Delayed speech & language development
  - No significant differences in mean scores of cognitive performance, but greater prevalence of scores <75
  - Behavioral problems: attention deficit, distractibility, aggressiveness (especially in boys), learning problems
  - Increased prevalence of child abuse/neglect

DIABETES MELLITUS (GESTATIONAL, TYPE I, AND TYPE II), MATERNAL

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CLASSIFICATIONS

- American Diabetes Association
  - Type I: juvenile onset, insulin dependant
  - Type II: adult onset, insulin dependant
  - Type III: gestational diabetes mellitus (GDM)
- White's
  - A – any, w/o vascular disease, dx'd before pregnancy
  - B – onset ≥ age 20 yr or duration <10 yr, w/o vascular disease
  - C – onset age 10–19 yr or duration 10–19 yr, w/o vascular disease
  - D – onset < age 10 yr or duration ≥ 20 yr, w/o vascular disease
  - F – nephropathy
  - H – atherosclerotic heart disease
  - R – proliferative retinopathy or vitreous hemorrhage
  - T – after renal transplantation

HISTORY & PHYSICAL

- Maternal classification of DM & degree of glycemic control (more complications w/ poor control) associated w/ the degree of complications in IDMs:
- Fetal/Neonatal
  - Embryopathy/Congenital anomalies (4–8× risk w/overt DM prior to pregnancy)
    - CNS (16× risk) – e.g., anencephaly, holoprosencephaly, meningomyelocele
    - Congenital heart disease (18× risk) – ventricular septal defect & transposition of great arteries most common, but risk of double outlet left ventricle & truncus arteriosus specifically increased
    - Renal
    - Musculoskeletal
      - Caudal regression sequence
      - Limb anomalies
  - Abnormal growth
    - Macrosomia (birth wt >90th percentile for gestational age or birth weight >4 kg)

- 15–50% of diabetic pregnancies (vs. 10–14% of nl pregnancies)
- Function of 2nd- & 3rd-trimester glycemic control
- Contributes to the higher frequency of intrapartum/birth injury
- IUGR: w/ maternal disease >10 years & coexisting nephropathy or retinal or cardiac disease

➢ Diabetic cardiomyopathy
- Predominantly septal hypertrophy (30%)
- May obstruct LV output
- Typically resolves by age 1 yr

➢ 2× increase in perinatal mortality rate

■ Neonatal

➢ Metabolic disorders
- Hypoglycemia
  - Peak occurrence: 30–90 min of age
  - Usually asymptomatic, but may be protracted & difficult to resolve
  - Related to the maternal glycemic control 6–12 wk before birth & maternal serum glucose at birth
  - Tight glucose control has not decreased prevalence of hypoglycemia.
- Hypocalcemia
  - Up to 50% of IDMs have serum calcium level <7 mg/100 mL
  - Peak occurrence: 24 h
  - Usually asymptomatic
  - If correction indicated, correction of associated hypomagnesemia may be necessary to do so
- Hypomagnesemia – related to maternal hypomagnesemia & severity of maternal diabetes

➢ Cardio/respiratory disorders
- Congestive cardiomyopathy (w/o hypertrophy) due to hypoglycemia, hypocalcemia &/or polycythemia – rare
- Respiratory distress syndrome (RDS)
  - 5–6× increased risk of RDS, adjusted for confounders
  - Risk persists to 38.5 wk completed gestational age

➢ Hematologic disorders
- Polycythemia/hyperviscosity
- Hyperbilirubinemia – due primarily to prematurity & polycythemia

- ➢ Birth injury (see **BIRTH TRAUMA**) – increased risk of shoulder dystocia w/macrosomia; fractures of humerus or clavicle, Erb's palsy, and/or phrenic nerve palsy
- ➢ Perinatal asphyxia
- ➢ Other
  - Small left colon syndrome
  - Renal vein thrombosis – rare

TESTS

- Hct at 2–4 h; repeat at 12 h w/ borderline elevation
- Serum glucose level q1–2h for first 6 h by bedside method until WNL & stable – values <40–50 mg/dL should be confirmed in lab, esp if persistent
- Serum Ca 12 and/or 24; serum Mg w/hypocalcemia
- Serum bilirubin indicated by physical exam or nursery protocol
- ECG, echocardiogram as indicated

DIFFERENTIAL DIAGNOSIS

N/A

MANAGEMENT

- Prevention
  - ➢ Maternal screening
    - 1st trimester 50-g glucose challenge test for high-risk pregnancies [maternal age >25 yr; h/o previous infant >4 kg, unexplained fetal demise, gestational DM; strong immediate family hx type 2 or GDM; obesity (>90 kg)]
  - ➢ Universal screening
    - 50-g glucose challenge test at 26–28 weeks gestation
    - If >135 mg/dL, either 2-h or 3-h glucose challenge test
      - Tight maternal glycemic control periconceptionally (w/ established DM) & during pregnancy
- Neonatal Rx
  - ➢ See **HYPOXIC ISCHEMIC ENCEPHALOPATHY; BIRTH TRAUMA; HYPERGLYCEMIA; HYPOCALCEMIA; HYPOMAGNESEMIA; HYPERBILIRUBUNEMIA, UNCONJUGATED; HYPERTROPHIC CARDIOMYOPATHY; CONGESTIVE HEART FAILURE**
  - ➢ Polycythemia/hyperviscosity – partial exchange transfusion
  - ➢ As indicated for congenital anomalies

SPECIFIC THERAPY
None

FOLLOW-UP
- Neurodevelopmental as indicated for neonatal complications
- As indicated for congenital anomalies

COMPLICATIONS AND PROGNOSIS
- Increased risk of childhood obesity w/macrosomia
- Increased risk of glucose intolerance in later childhood & adulthood
- Other long-term problems depend on neonatal complications

ETHANOL USE/ABUSE, MATERNAL

See **FETAL ALCOHOL SPECTRUM DISORDERS** in the "Neonatal Conditions" section.

FACTORS FOR NEONATAL GBS INFECTION, MATERNAL: GBS COLONIZATION/PREVIOUS INFANT WITH INVASIVE GBS DISEASE/ROM >18 H/MATERNAL INTRAPARTUM TEMPERATURE ≥100.4°F

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Early-onset group B streptococcal (GBS) disease (sepsis, pneumonia, meningitis)
- Onset: birth-7 d (mean 20 h)
- Incidence
  - 0.5 in 1,000 live births
  - 1–2% of infants of GBS-colonized mothers
- 15–40% mothers colonized
- 50% infants of GBS + mothers colonized
- Maternal risk factors
  - Colonization w/ GBS
  - High genital GBS inoculum
  - Urinary tract infection
  - Asymptomatic bacteriuria
  - Previous infant with invasive GBS disease
  - Age <20 y
  - Black race