2nd Half Pregnancy

Intrauterine Growth Restriction: Diagnostics

Background

1. Definition
   - Intrauterine growth restriction (IUGR)
     - Fetus w/ estimated wt <10th percentile for gestational age
   - Small for gestation age (SGA)
     - Infant w/ birth wt <10th percentile
   - Constitutionally small
     - Healthy infants on low-end of growth curve
2. General info
   - 10% of all pregnancies will meet criteria for IUGR based on percentage cut-off
     - Many will be nml, constitutionally small
     - Must differentiate nml from pathologic
     - Lower cut-off may be more accurate in finding pathologic processes (5th or 3rd percentile)
   - IUGR diagnosis controversial
     - Guidelines for diagnosis and mgmt vary by country [2]
     - This summary follows ACOG guidelines
3. Normal fetal growth patterns
   - Cellular hyperplasia (1st 16 wks)
   - Hyperplasia and hypertrophy (16-32 wks)
   - Cellular hypertrophy (32-term)
   - Head circumference (HC) / abdominal circumference (AC) ratios:
     - Decr linearly through pregnancy
4. Abnormal fetal growth patterns
   - Symmetric:
     - 20-30% of IUGR
     - All fetal organs decr proportionally, impairment of early fetal cellular hyperplasia (genetic abnl)
   - Asymmetric:
     - 70-80% of IUGR
     - Greater decr in AC (liver, SQ fat) compared w/HC, fetal adaptation to hostile environment (redistribution of blood flow to vital organs at expense of nonvital organs)
5. Abbreviations
   - AC: abdominal circumference
   - AFV: amniotic fluid volume
   - AGA: appropriate for gestational age
   - EFW: estimated fetal weight
   - EGA: estimated gestational age
   - FH: fundal height
   - FL: femur length

- GA: gestational age
- HC: head circumference
- SGA: small for gestational age
- S/D ratio: systolic / diastolic ratio

Pathophysiology

1. Pathology
   - Variable, dependant on etiology
   - Uteroplacental insufficiency
     - Decr supply of nutrients/oxygen to developing fetus
   - See risk factors
2. Incidence
   - By defn 10% of all pregnancies will meet criteria
   - Incidence of pathologic IUGR <10%
3. Risk factors
   - Maternal medical conditions
     - HTN, preeclampsia
     - Chronic renal dz
     - Hypoxia
       - Cyanotic heart dz
       - Lung dz
       - High altitude
     - Diabetes
     - SLE/antiphospholipid syndrome
     - Collagen vascular dz
     - Hemoglobinopathies
   - Maternal behavioral conditions
     - Smoking
     - Alcohol use
     - Substance abuse, including
       - Methadone
       - Cocaine
       - Heroin
     - Poor wt gain, malnutrition
     - Hx of prior SGA infant
     - Maternal age extremes (<16 yo or >35)
     - Low socioeconomic status
   - Placental
     - Small placental size
     - Abruption
     - Previa
     - Infarcts
     - Confined placental mosaicism
     - Chorioangioma
   - Fetal

- Genetic abnormalities
    - Aneuploidy
    - Trisomy
    - Ring chromosomes
- Congenital malformations
    - Anencephaly
- Multiple gestation
- Infections
    - Rubella
    - CMV
    - Varicella
    - Toxoplasmosis
    - Syphilis
- Teratogen exposure
    - Warfarin
    - Phenytoin
    - Methotrexate

4. Morbidity /mortality
    - Sig incr risk for oligohydramnios and stillbirth
        - Depends on GA, etiology, deg of IUGR/SGA
    - Higher rates of cesarean delivery due to incr incidence of abnormal heart tones and oligohydramnios
    - Neonatal polycythemia, hyperbilirubinemia, hypoglycemia, hypothermia, apnea
    - Low APGARs

Diagnostics

1. History
    - Assess for presence of risk factors
2. Physical exam
    - Screen all pregnancies with serial FH measurements
        - FH: upper edge pubic symphysis to top of fundus
            - Approximates GA after 20 wks gestation
            - Serial measurements starting at 20 wks gestation
            - Difference of 3 cm from EGA: abnormal
                - Esp at 32-34 wks GA
        - Accuracy varies widely
            - Improved if same provider examines every time
3. Initial evaluation
    - Accurate GA is crucial
    - Screen for risk factors
    - Fetal anatomic survey
        - Identify major congenital anomalies
    - Fetal karyotyping
        - Structural abnl, early or severe IUGR, polyhydramnios
        - 10-20% of structural abnormalities have abnl karyotype

- o Infectious dz evaluation
  - ▪ Maternal serum studies
    - ▪ Suspicion of infection
    - ▪ Check for evidence of seroconversion (CMV, rubella, VZV)
  - ▪ Amniotic fluid testing for viral DNA as indicated
- o Thrombophilic disorder
  - ▪ Especially if recurrent, early or severe
  - ▪ ATIII, protein C&S, Factor V Leiden, prothrombin gene mutation (PCR), APLAb, homocysteine

4. Periodic evaluation
   - o Optimal method and frequency not established
     - ▪ Test to determine benefit of preterm delivery
     - ▪ Start at point of viability
   - o Serial EFW (U/S): every 2-4 wks
   - o Biophysical Profile (BPP)
     - ▪ 1-2/wk
     - ▪ Every day if ≥1 significant abnl
       - ▪ Severe IUGR (<3rd percentile), severe oligohydramnios, absent or reversed flow on Doppler, borderline BPP scores
       - ▪ Insufficient evidence to evaluate BPP as test of fetal well-being in high risk pregnancies
   - o Amniotic fluid: part of BPP
   - o Doppler velocimetry: 1/wk
     - ▪ Abnl umbilical vein or ductus venosus highest risk of imminent demise
   - o Fetal blood sampling
     - ▪ Assess fetal acid base status to assist timing of delivery
     - ▪ 9-14% procedure-related loss so repeat use limited due to high loss rate

5. Diagnostic tests
   - o U/S should be done for high-risk pregnancies or those with discordant fundal heights [1,3]
     - ▪ EFW
     - ▪ Fetal biometrics
     - ▪ Anatomic survey
     - ▪ Amniotic fluid volume
   - o Biophysical profile
     - ▪ Not indicated for initial Dx of IUGR
   - o Doppler U/S
     - ▪ Not indicated for initial Dx of IUGR

Therapeutics

1. Acute Tx
   - o Appropriately timed delivery
     - ▪ Only intervention that improves morbidity/mortality of IUGR infant
2. Further mgmt (24 hrs)
   - o Antenatal surveillance

- Indicated once Dx of IUGR confirmed and fetus is viable
- Goal to assess fetal growth rate, fetal well being, and amniotic fluid volumes to minimize complications
- Methods of antenatal surveillance
    - Serial Doppler U/S for absence or reversal of flow in the umbilical cord
    - Serial BPPs, modified BPPs, or non-stress tests 1-2x per week
    - Serial U/S for growth rate (q2-4 wk)
- Interventions
    - If antenatal surveillance reassuring, continue
    - If antenatal surveillance nonreassuring, consider prompt delivery
    - Term and late preterm infants should be delivered
    - Preterm infants <34 wks GA with IUGR are more complicated; require perinatal input as to their timing
    - Evaluation of fetal lung maturity may help in decision to deliver
  - o Other studies
    - Karyotyping indicated in extreme IUGR or if anatomic abnormalities present

Follow-Up

1. Return to office
   - o Timeframe for return visit
     - Weekly for antenatal testing
2. Refer to specialist
   - o Consider referral to high-risk OB once Dx confirmed
3. Admit to hospital
   - o For induction/delivery if antenatal testing nonreassuring

Prognosis

1. Prognosis depends on etiology
   - o Guarded prognosis
     - Intrinsic fetal factors (aneuploidy, congenital malformations, infection)
   - o Better prognosis
     - Inadequate substrates for fetus and decreased O2 (dependent upon eval, monitoring and timing of delivery)
2. Recurrence risk
   - o SGA risk in 2nd pregnancy 29% (vs 9% if 1st pregnancy AGA)
   - o SGA risk in 3rd pregnancy after 2 SGA births 44%
3. Long-term outcomes of infants
   - o Normal catch-up of growth by age 2 in most cases
   - o 2x incr risk of neurological sequalae
   - o More prone to HTN and CVD as adults

Prevention

1. No evidence that the following treat IUGR
    o Nutrient/mineral supplementation
    o Volume expansion
    o Maternal oxygen therapy
    o Antihypertensive therapy
    o Heparin
    o ASA
2. Avoid smoking during pregnancy

Patient Education

1. Handout from American Academy of Family Physicians
    o http://familydoctor.org/online/famdocen/home/women/pregnancy/fetal/313.html

References

1. Restriction. ACOG Practice Bulletin Number 12. January 2000.
2. Chauhan SP, Gupta LM, Hendrix NW, et al. Intrauterine growth restriction: comparison of American College of Obstetricians and Gynecologists practice bulletein with other national guidelines. Am J Obstet Gynecol 2009;200:409.e1-409.e6.
3. American College of Radiology. Growth disturbances - risk of intrauterine growth restriction. ACR Appropriateness Criteria. 1996, reviewed 2007.

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