Intrauterine Growth Restriction: Diagnostics

Background

1. Definition
   o Intrauterine growth restriction (IUGR)
     ▪ Fetus w/ estimated wt <10th percentile for gestational age
   o Small for gestation age (SGA)
     ▪ Infant w/ birth wt <10th percentile
   o Constitutionally small
     ▪ Healthy infants on low-end of growth curve
2. General info
   o 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)
   o IUGR diagnosis controversial
     ▪ Guidelines for diagnosis and mgmt vary by country
     ▪ This summary follows ACOG guidelines
3. Normal fetal growth patterns
   o Cellular hyperplasia (1st 16 wks)
   o Hyperplasia and hypertrophy (16-32 wks)
   o Cellular hypertrophy (32-term)
   o Head circumference (HC) / abdominal circumference (AC) ratios:
     ▪ Decr linearly through pregnancy
4. Abnormal fetal growth patterns
   o Symmetric:
     ▪ 20-30% of IUGR
     ▪ All fetal organs decr proportionally, impairment of early fetal cellular hyperplasia (genetic abnl)
   o 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
   o AC: abdominal circumference
   o AFV: amniiotic fluid volume
   o AGA: appropriate for gestational age
   o EFW: estimated fetal weight
   o EGA: estimated gestational age
   o FH: fundal height
   o FL: femur length
Pathophysiology

1. Pathology
   - Variable, dependant on etiology
   - Uteroplacental insufficiency
     - Decreased supply of nutrients/oxygen to developing fetus
   - See risk factors

2. Incidence
   - By definition, 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
     - Abruptio
     - 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
    - Other studies
      - Karyotyping indicated in extreme IUGR or if anatomic abnormalities present

Follow-Up

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

Prognosis

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

Prevention
1. No evidence that the following treat IUGR
   - Nutrient/mineral supplementation
   - Volume expansion
   - Maternal oxygen therapy
   - Antihypertensive therapy
   - Heparin
   - ASA

2. Avoid smoking during pregnancy

Patient Education

1. Handout from American Academy of Family Physicians

References


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