

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

- 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
- Thrombophilic disorder
 - Especially if recurrent, early or severe
 - ATIII, protein C&S, Factor V Leiden, prothrombin gene mutation (PCR), APLAb, homocysteine
- 4. Periodic evaluation
 - Optimal method and frequency not established
 - Test to determine benefit of preterm delivery
 - Start at point of viability
 - Serial EFW (U/S): every 2-4 wks
 - 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
 - Amniotic fluid: part of BPP
 - Doppler velocimetry: 1/wk
 - Abnl umbilical vein or ductus venosus highest risk of imminent demise
 - 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
 - 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
 - Biophysical profile
 - Not indicated for initial Dx of IUGR
 - Doppler U/S
 - Not indicated for initial Dx of IUGR

Therapeutics

1. Acute Tx
 - Appropriately timed delivery
 - Only intervention that improves morbidity/mortality of IUGR infant
2. Further mgmt (24 hrs)
 - 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
 - <http://familydoctor.org/online/famdocen/home/women/pregnancy/fetal/313.html>

References

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3. American College of Radiology. Growth disturbances - risk of intrauterine growth restriction. ACR Appropriateness Criteria. 1996, reviewed 2007.

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