Intrauterine Growth Restriction

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IUGR

- Complicated and difficult clinical challenge
- Elevated risks across age spectrum
  - Fetal morbidity/mortality
  - Neonatal morbidity/mortality
  - Infancy with neurodevelopmental delays
  - Potential for lifelong sequelae

IUGR and SGA not interchangeable

SGA: Growth restriction at birth
  - Newborns < 10%tile for gestational age

IUGR: Prenatal diagnosis of restricted growth
  - Fetus < 10%tile for gestational age
IUGR

- Simply Stated -

- The failure to realize genetically predetermined growth potential

IUGR

- Fetal/Neonatal Impact -

- Prematurity, oligohydramnios, non-reassuring fetal heart rate monitor
- Increased risk cesarean delivery, neonatal acidemia and depression
- Increased risk neonatal metabolic instability
- Mortality increase tied to severity, onset, and etiology
  - Risk of IUFD
    - 1.5% with EFW < 10%tile (2x background risk)
    - 2.5% with EFW < 5%tile
IUGR
-Infant/Adult Consequences-

- Spectrum of neurodevelopmental delays
- Associated with lifelong sequelae
  - Barker’s fetal origins hypothesis
  - Dyslipidemia, diabetes, HTN, CAVD
- Important caveat:
  - IUGR and SGA have multiple causes
  - Risk in “lumping” outcomes
  - Range from trivial to devastating

IUGR
-Diagnosis-

- Reliable estimate of gestational age is critical to all management schemes
- At-risk patients: establish gestational age early
  - First trimester CRL more accurate than last menstrual period

IUGR
-Screening-

- Historically, 50% of IUGR fetuses not diagnosed until time of delivery
  - Probably not true today
- Clinically, all patients are “screened” for IUGR with serial fundal heights
- View as starting point for further studies
IUGR
-Maternal Risk Factors-
- Hypertensive disorders
- Renal or connective tissue disease
- Pregestational DM
- Antiphospholipid Syndrome (APS)
- Cardiac/Pulmonary disease
- Tobacco/Substance abuse
- Multiple gestations
- Teratogens
- Infectious diseases
  - Malaria most common cause IUGR worldwide
- Prior SGA infant
  - 20% recurrence risk

IUGR
-Fetal/Placental Factors-
- Previa, abruption, velamentous insertion, infarction, SUA
- Multiple gestation; prematurity
- Unexplained MSAFP elevation
- Infection, anomaly, aneuploidy

IUGR
-Diagnosis-
- Requires fetal biometrics via US
- Abdominal circumference (AC) and estimated fetal weight (EFW) best predictors of birth weight < 10th %
- EFW derived from BPD/HC, AC, and FL
IUGR
-Diagnosis-

- Customized v. population-based standards
  - Variables
    - Maternal height/weight, ethnicity, parity, fetal gender
    - May better distinguish pathology v. constitutional SGA
  - Ethnicity-specific birthweight distributions
    - Caucasian, Chinese, South Asian
    - Better identified infants at risk for adverse outcomes
      - Eliminated healthy, but constitutional SGA

IUGR Screening and Diagnosis
-Bottom Line-

- Assign gestational age early
- Survey all pregnancies for risk factors
- Maintain high index of suspicion
- Diagnose with EFW <10th % derived from BPD/HC, AC, and FL

IUGR
-Fetal Monitoring-

- Once IUGR diagnosed, management consists of continual fetal reassessment to determine if risk of continued intrauterine expectant management outweighs risk of delivery
  - Critical factors
    - Gestational age
    - Growth trends
    - Fetal surveillance data
IUGR - Fetal Surveillance Tools -

- Non-Stress test (NST)
  - False negative rate 2-3/1000
  - Negative predictive value 99.8%
  - False positive rate 80%
  - Typically performed 1-2 times/week

- Amniotic fluid volume assessment
  - Oligohydramnios often associated with IUGR
  - Tied to adverse perinatal outcome
  - Normal AFV does not exclude Dx of IUGR
  - Oligohydramnios diagnosis: AFI v. MVP
    - Use of MVP < 2 cm, as opposed to AFI < 5 cm, to diagnose oligohydramnios is associated with a reduction in unnecessary interventions without an increase in adverse outcomes
  - Test frequency based on clinical status

- Biophysical profile (BPP)
  - False negative rate 0.8/1000
  - Negative predictive value 99.9%
  - False positive rate 40%-60%
  - Performed 1-2 times/week
IUGR - Fetal Surveillance Tools -

- Umbilical arterial Doppler indices
  - Pulsatility index
  - Systolic-diastolic ratio (S-D/A)
  - Systolic/Diastolic ratio (S/D)
  - Resistance index
  - Systolic-diastolic/systolic (S-D/S)

- Absent end diastolic flow: poor prognosis
  - Hypoxemia, acidemia, perinatal mortality

- Reverse end diastolic flow outcome worse

Doppler Indices
IUGR - Fetal Surveillance Tools -

- Middle cerebral artery doppler evaluation
- Brain sparing evident by increased end diastolic flow

IUGR - Fetal Surveillance Tools -

- Work utilizing ductus venosus
- Ductus venosus shunts highly oxygenated blood from umbilical vein directly to fetal IVC, bypassing liver, and perfusing fetal brain
IUGR
-Fetal Surveillance Tools-

Unlike umbilical artery or MCA abnormalities which may be present for weeks, absence or reversal of ductus venosus a-wave appears to occur late in progression of placenta-based IUGR

PORTO study
- Prospective Observational Trial to Optimize Pediatric Health
- 1100 patients with EFW < 10th tile (Ireland); 2010-2012
- Predictable progressive sequence of abnormal Dopplers
- Classic pattern of abnormal UA to MCA to DV existed, but no more frequently than any other sequence
- Multiple potential patterns of Doppler deterioration noted
- Abnormal UA and MCA Doppler strongest predictors adverse events
  - Marginal added benefit to DV indices
- Data question whether logical sequence of deterioration exists
  - Renders interpretation of Doppler deterioration challenging
IUGR - Fetal Surveillance Tools -

- No data demonstrating improved perinatal outcomes
  - NST, BPP, AFI
- With IUGR, data do demonstrate improvement in outcomes with Doppler surveillance
  - Mortality, cesarean delivery for distress, intervention, NICU admission
- Doppler indices not effective as screening tool

IUGR - Aneuploidy and Anomalies -

- Associated with anomalies and aneuploidy
- Index of suspicion increased
  - Severe
  - Early-onset
  - No HTN
  - Normal AFV
  - Normal Doppler indices
- Targeted anatomic fetal survey
- Early aneuploidy screening
  - Invasive testing if suspicious

IUGR - Therapeutic/Preventative Interventions -

- Measures with no clear benefit
  - Bed rest
  - Nutritional supplements
    - Fish, low-fat meats, grains, fruits, low-salt diet
    - Iron, zinc, calcium, protein, magnesium, vitamin D
  - Oxygen administration
  - Pharmacologic therapy including asa
IUGR
-Therapeutic Interventions-

- Most underlying causes not responsive to therapy or fetal growth not improved by treatments benefiting mother
  - DC tobacco, substance abuse
  - Treat maternal toxoplasmosis/malaria
  - Treat maternal HTN

IUGR
-Management-

- Once EFW < 10th %, start testing
  - Umbilical artery Doppler indices weekly
  - AFV
  - NST/BPP
- If reassuring, manage expectantly
- If Doppler indices abnormal
  - Intensify surveillance
  - Hospitalize if absent EDV
IUGR
-Absent EDV 34+ Weeks-

- Strongly consider immediate delivery
- Associated ominous findings
  - Absent fetal growth on serial scans
  - Progression to reverse EDV
  - Non-reactive NST or BPP < 6
  - Oligohydramnios

IUGR
-Absent EDV < 34 Weeks-

- Daily surveillance with NST/BPP; serial UA dopplers
- BMZ to accelerate fetal lung maturity
- Individualize fetal assessment
  - Deliver at point that fetal risk in-utero appears greater than risk of prematurity
- Additional Doppler surveillance
  - MCA diastolic flow evaluation
  - Ductus venosus
- Magnesium sulfate for neuroprotection if delivery < 32 weeks

IUGR
-Intrapartum Management-

- Candidates for intensive intrapartum EFM
- Alert neonatology and anesthesia
- Increased frequency variable decelerations and overall non-reassuring FHR pattern
- Low threshold for cesarean section
  - But, IUGR alone is not indication for CS
IUGR - Overview -

- Differentiation of normal vs. pathologic growth is often unreliable
- Failure to realize predetermined growth potential is key concept
- Early gestational age confirmation is critical

IUGR - Overview -

- Maintain high index of suspicion
- Diagnose with EFW < 10%
- Screen for maternal & fetal risk factors
- Frequent & intensive fetal surveillance
- NST, BPP, Doppler indices
- Serial US for EFW
  - Watch trends carefully

IUGR - Overview -

- Proposed therapeutic interventions of little demonstrated value
- Dynamic, potentially dangerous status
  - Again, watch growth/testing trends
- Monitor presence or absence of EDV
  - Consider doppler interrogation other fetal vessels
IUGR -Overview-

- Deliver at point that fetal risk in-utero appears greater than risk of prematurity
  - 38-39 weeks
  - Otherwise uncomplicated; no concurrent findings
  - Or, 37 weeks if < 6%tile, 38 weeks if < 11%tile
  - 34-37 weeks
  - Oligo, abnormal Dopplers, maternal risks/co-morbidities
  - Expeditious delivery regardless of gestational age
  - Persistent abnormal fetal surveillance suggesting imminent fetal jeopardy