IUGR (FGR)– Detection and Surveillance

Definition: (several different definitions have been used)
Abdominal circumference below 10th percentile
Weight at birth <2500 g
EFW <10th percentile
AC <10th percentile
EFW <10th percentile with abnormal Doppler indices in the umbilical artery or middle cerebral artery
AC <10th percentile with abnormal umbilical artery or middle cerebral Doppler studies.

ACOG (PB 134) usage of terms: (distinguished by the time of identification)
IUGR (FGR): *Fetus* with estimated weight below 10th percentile.
SGA: *Newborns* with weight below the 10th percentile for gestational age.

Consequences:
An association between birth weight below the 10th percentile and development later in life of hypertension, hypercholesterolemia, coronary heart disease, impaired glucose tolerance, and diabetes.

Etiologies:
Genetic factors:
40% of total birth weight is ascribable to genetic factors
60% due to fetal environmental contributions
Maternal genes have the primary influence on birth weight.
Women who were growth restricted have increased risk of having an IUGR fetus.
Specific maternal genotypic disorders that can cause IUGR: phenylketonuria and dysmorphic syndromes such as dwarfism.
50% of fetuses with trisomy 13 or trisomy 18 have FGR.
Confined placental mosaicism has been associated with FGR.

Congenital anomalies:
IUGR is noted in many fetuses with congenital anomalies, including cardiac malformations (50 to 80% of fetuses with septal defects), and umbilical artery anomalies, including abnormal cord insertions.
25% of fetuses with a 2-vessel cord weigh less than 2500 g at birth.
Gastroschisis also is often associated with growth restriction and is present in up to 25% of cases.

Infection:
Intrauterine infection underlies 5% to 10% of IUGR.
Malaria, protozoan infections, and viral infections (cytomegalovirus, rubella, toxoplasmosis, herpes zoster, human immunodeficiency virus, varicella, and syphilis)
Chorioamnionitis is associated with symmetric growth restriction between 28 and 36 weeks, and with asymmetric growth restriction after 36 weeks.

Multiple gestations:
25% risk of IUGR for twin pregnancies

60% risk for higher-order gestations.
Monochorionic pregnancies are at an additional risk or discordant fetal growth restriction.

Maternal nutrition:
Decreased maternal caloric and protein intake, especially before 26 weeks.
Decreased oxygen content inhibits fetal metabolism (hemoglobinopathies, chronic pulmonary disease, and severe maternal kyphoscoliosis)

Environmental toxins:
Cigarette smoking, excess alcohol ingestion, illicit drug use (esp. cocaine)
Medications: phenytoin, warfarin, and trimethadione

Placental factors:
Poor uteroplacental perfusion as a result of abnormal placentation is the most common placental etiology associated with IUGR.
Other placental disorders: abruption, infarction, hemangioma, and cirumvallate shape

Maternal vascular disease:
Diabetes, chronic hypertension, PIH, advanced maternal age, morbid obesity

Detection

Maternal physical exam alone inaccurate in up to 50% of cases.
A single fundal height measurement at 32 to 34 weeks is 65 to 85% sensitive and 96% specific for detecting IUGR.
If suspected, do ultrasound for EFW. If below the 10^{th} percentile, further US evaluation should include Doppler flow studies, AFI, and evaluation for structural abnormalities.

Intrinsic insults that occur early in pregnancy are likely to result in a symmetric growth restriction.
Extrinsic insults occurring later in pregnancy will likely result in asymmetric growth restriction.

Terminology

1. "SGA" refers to small fetuses with no discernible pathology and with normal umbilical artery and middle cerebral artery Doppler results.
2. "Growth restricted" refers to small fetuses with recognizable pathology and abnormal Doppler studies.
3. "Idiopathic growth restricted" applies to small fetuses with no discernable pathology or abnormal Doppler studies.

Staging of IUGR

- Stage 0: fetuses with an EFW or an AC $<10^{th}$ percentile. Doppler of the umbilical artery and middle cerebral artery is normal.
- Stage I: fetuses whose EFW or AC is $<10^{th}$ percentile plus abnormal Doppler flow of the umbilical artery or middle cerebral artery.

- Stage II: fetuses whose EFW or AC is <10th percentile plus absent or reversed Doppler flow of the umbilical artery.
- Stage III: fetuses whose EFW or AC is <10th percentile plus absent or reversed Doppler flow of the ductus venosus.
  Based on the AFI, the IUGR fetus will be either:
  "A" AFI <5 cm
  "B" AFI ≥5 cm

Categorizing IUGR based on Gestational Age at time of Diagnosis

- Very early IUGR: Diagnosed ≤29 weeks
- Early IUGR: Diagnosed between >29 and <34 weeks
- Late IUGR: Diagnosed >34 weeks

Staging System and Management

- Stage 0 SGA: fetuses have a good prognosis. Manage as outpatient with Doppler assessment every 2 weeks. If Doppler remains normal, delivery is recommended at term. If the Doppler becomes abnormal, these fetuses are managed as Stage I IUGR fetuses.
- Stage I IUGR: fetuses have mild growth restriction, and affected mothers without preeclampsia are usually managed as outpatients. Antenatal corticosteroids should be given at time of diagnosis. Twice-weekly antenatal testing is recommended. If NST remains reactive and AFI remains >5 cm, delivery recommended at 37 weeks. If umbilical artery Doppler becomes absent, these fetuses should be managed as Stage II IUGR.
- Stage II IUGR: fetuses managed as inpatients. Fetus should undergo daily antenatal testing with twice-daily NST and daily BPP. If NST remains reassuring and the BPP score remains between 6 and 8 continuation of expectant management is recommended. Antenatal steroids at time of diagnosis. Delivery at 34 weeks. If NST becomes non-reassuring or if BPP score 4 of 8 on 2 occasions at least 4 hours apart, immediate delivery by cesarean section is recommended.
- Stage III IUGR: Managed same as Stage II except for delivery at 32 weeks regardless of age at time of diagnosis. Steroids at time of diagnosis.

Doppler Ultrasound as an Indication for Delivery

Fetuses with Stage I or higher IUGR involving abnormal Doppler studies should be monitored closely. Antenatal testing is recommended and frequency ranges from twice weekly to multiple times daily, depending on level of severity. Delivery solely on the basis of abnormal Doppler studies has not been proven beneficial and, in most cases, fetuses with abnormal Doppler studies do well in the setting of reassuring antenatal testing. If antenatal FHR testing is Category III, then immediate delivery is warranted.

Delivery Mode for IUGR Fetuses

Data support cesarean delivery when there is absent or reversed flow of the umbilical artery because these fetuses rarely tolerate attempts at vaginal delivery. A fetus ≥34 weeks with an abnormal umbilical artery S/D ratio but a normal BPP is not likely to tolerate labor.