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Fetal Growth Restriction

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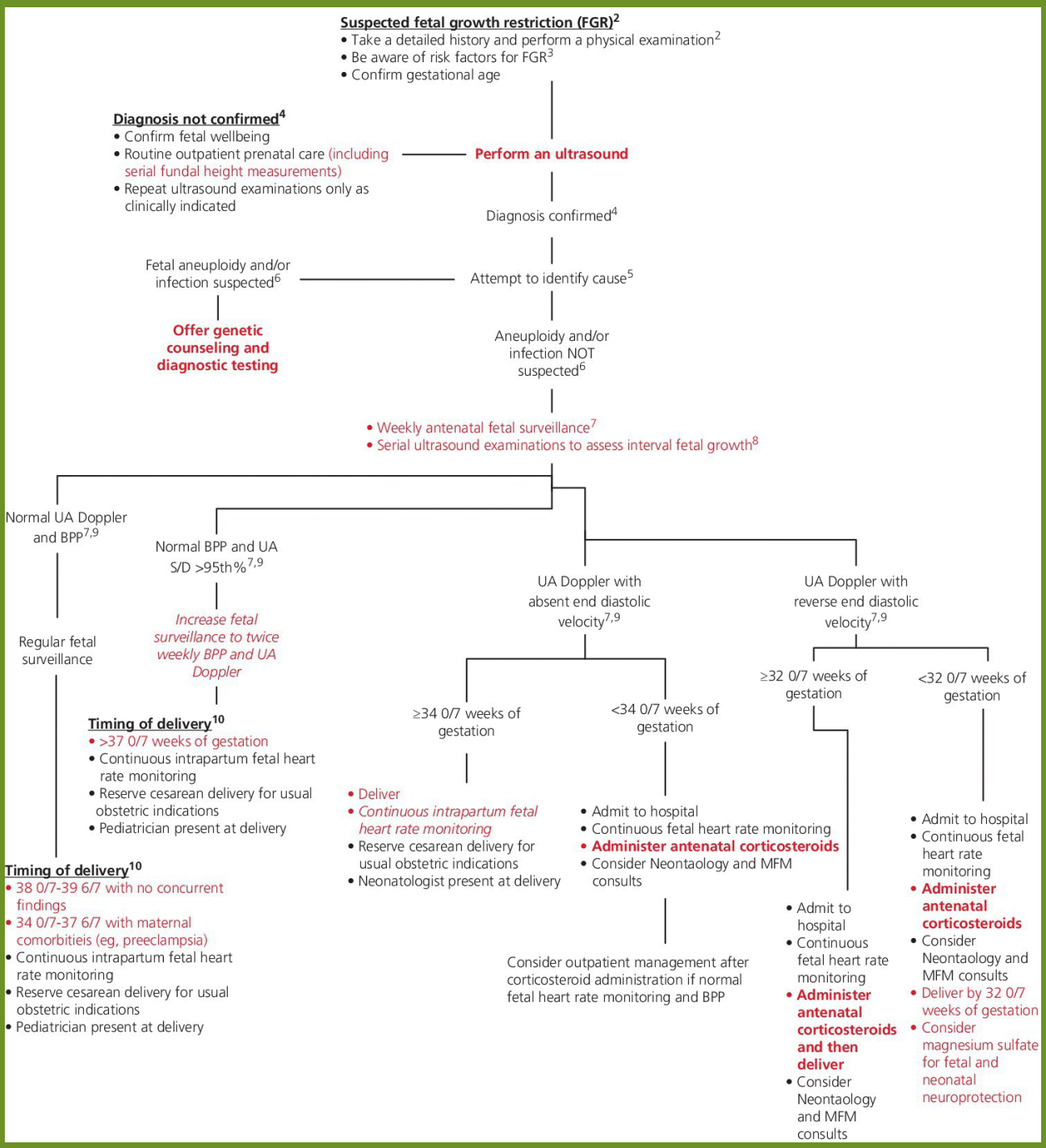

1. ACOG defines fetal growth restriction (FGR) as fetuses with an estimated fetal weight (EFW) <10th percentile for gestational age; the term small for gestational age (SGA) is reserved for newborns with birth weight <10th percentile for gestational age.
2. Several studies have shown that customized birth weight percentiles more accurately reflect the potential for adverse outcome.
3. Findings from a recent study suggest that the only ultrasound EFW consistently and significantly associated with adverse compared to normal outcome was that of the <3rd percentile.

4. FGR can be subdivided into asymmetric and symmetric growth restriction.
5. With symmetric growth restriction, the weight and skeletal dimensions are both below normal, whereas asymmetrically small FGR infants have normal skeletal measurements and head size, but the weight is below normal due to decreased abdominal circumference.
6. The symmetrically small fetus (20–30%) is usually the result of some factor that influences growth in early pregnancy, most commonly fetal aneuploidy, malformations, or infection. The FGR fetus with an asymmetric growth pattern is most commonly the result of placental disease.

1. In the United States, approximately 4–8% of fetuses are diagnosed with FGR. FGR fetuses have higher rates of perinatal morbidity and mortality as compared with appropriate for gestational age (AGA) fetuses for any given gestational age. Neonatal morbidity associated with FGR includes meconium aspiration syndrome, hypoglycemia, polycythemia, and neonatal asphyxia.
2. Premature FGR infants are also at increased risk of mortality, necrotizing enterocolitis, and need for neonatal respiratory support. Long-term studies show a twofold increased incidence of cerebral dysfunction (ranging from minor learning disability to cerebral palsy) in FGR infants delivered at term, and an even higher incidence if the infant was born preterm.
3. Epidemiologic studies also suggest that these infants may be at higher risk for developing chronic disease in adulthood such as type 2 diabetes mellitus, obesity, stroke, and coronary heart disease.ary tract infection.

1. The clinical diagnosis of FGR is difficult, and physical examination alone will fail to identify up to 50% of FGR fetuses.
2. Fundal height measured in centimeters between 24–38 weeks approximates the gestational age and is used to screen for FGR, using a discrepancy of greater than 3.
3. A single fundal height measurement at 32–34 weeks of gestation has been reported to be 65–85% sensitive and 96% specific for detecting FGR. Fundal height measurements are limited by maternal obesity and uterine leiomyomas.

4. FGR can be the result of maternal, fetal, and/or placental factors. Maternal etiologies include pre-existing medical conditions such as pregestational diabetes mellitus, renal insufficiency, autoimmune disease (e.g., SLE), cyanotic cardiac disease, antiphospholipid antibody syndrome and chronic hypertension; hypertensive disorders of pregnancy (e.g., gestational hypertension or preeclampsia) are additional causes.
5. Maternal substance use and abuse (e.g., tobacco, alcohol, cocaine, or narcotics), teratogen exposure (antithrombotic drugs), and infectious diseases (e.g., malaria, cytomegalovirus, rubella, toxoplasmosis, or syphilis) can also result in FGR.

1. FGR is a radiologic diagnosis. The diagnosis is made when sonographic EFW is <10th percentile for gestational age, using the biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur diaphysis length (FDL).
2. As such, accurate gestational age dating is a prerequisite for the diagnosis. FGR likely represents the clinical end-point of many different fetal, uteroplacental, and maternal conditions.
3. Every effort should be made to determine the cause prior to delivery. Since FGR fetuses have a high incidence of structural and genetic abnormalities, investigations should include a detailed fetal anatomic survey.
4. The placenta and umbilical cord should also be closely inspected since certain placental disorders (e.g., abruption, infarction, circumvallate shape, hemangioma, and chorioangioma) and umbilical cord disorders (e.g., single umbilical artery, velamentous or marginal cord insertion) are associated with FGR. In addition, preeclampsia and antiphospholipid antibody syndrome should be excluded.

1. The risk of aneuploidy is increased if fetal structural abnormalities are present and/or if fetal growth restriction is detected earlier in gestation (onset in the midtrimester); in these settings, genetic counselling and prenatal diagnostic testing (amniocentesis for karyotype and PCR for cytomegalovirus and toxoplasmosis; or noninvasive prenatal diagnosis with maternal cell-free fetal DNA testing) should be offered. Management should then be directed at the underlying etiology, if identified.
2. Fetal surveillance should be instituted once FGR has been diagnosed and the gestational age is such that delivery would be considered for perinatal benefit. Antenatal surveillance should include daily fetal kickcounts and either
3. (i) weekly or twice-weekly non-stress test (NST) with amniotic fluid assessment (modified biophysical profile); or (ii) weekly or twice-weekly biophysical profile (BPP) with NST. Doppler evaluation of the umbilical artery should also be performed at least once weekly, with the systolic to diastolic (S/D) ratio being the most common quantitative measurement.
4. Doppler velocimetry of the umbilical artery assesses the resistance to blood perfusion of the fetoplacental unit. Maternal or placental conditions that obliterate placental vessels result in a progressive decrease in end-diastolic flow in the umbilical artery Doppler waveform until absent, and then reversed, flow during diastole is evident

1. Reversed end-diastolic flow in the umbilical arterial circulation represents an advanced stage of placental compromise and has been associated with obliteration of >70% of arteries in placental tertiary villi. Absent or reversed end-diastolic flow in the umbilical artery is commonly associated with severe (birth weight <3rd percentile) FGR and oligohydramnios. Umbilical artery Doppler evaluation of the fetus with suspected FGR can help differentiate the hypoxic growth-restricted fetus from the nonhypoxic small fetus, and thereby reduce perinatal mortality and unnecessary interventions. Clinical management based on Doppler evaluation of the umbilical artery in fetuses with FGR is associated with fewer perinatal deaths and fewer inductions of labor and cesarean deliveries.
2. Serial growth scans should be performed every 3 to 4 weeks. Ultrasound assessment of growth performed more frequently than every 2 weeks may be associated with inherent error in ultasonographic measurements and is not recommended.
3. Umbilical artery Doppler blood flow studies can be used clinically to guide interventions such as the frequency and type of other fetal testing, hospitalization, antenatal corticosteroid administration, and delivery. Experts have recommended Doppler surveillance up to 2–3 times per week when FGR is complicated by oligohydramnios or absent or reversed umbilical artery end-diastolic flow. Doppler changes precede deteriorating BPP scores in fetuses with severe FGR, primarily during the week before delivery.

1. The umbilical artery Doppler changes occur approximately 4 days before BPP deterioration. Fetal breathing movement begins to diminish 2–3 days before delivery; amniotic fluid volume begins to decrease within 24 hours; composite BPP score decreases abruptly on the day of delivery, with loss of fetal movement and tone. FGR fetuses with normal BPP and Doppler velocimetry can be monitored as outpatients. Once absent or reverse end-diastolic blood flow is noted in the umbilical artery, the patients are admitted to the hospital for prolonged fetal monitoring, administration of antenatal corticosteroids, and possible delivery. Although there are no randomized studies to guide the decision to hospitalize, admission may also be offered once fetal testing more often than 3 times per week is deemed necessary.
2. According to ACOG, FGR fetuses should be delivered when the risk of fetal death exceeds that of neonatal death. The risk of fetal death among FGR fetuses at <3rd percentile is three-fold higher than that of fetuses between the 3rd and 5th centile and 4- to 7-fold higher than fetuses between the 5th and 10th centile. The decision to deliver is frequently based on “non-reassuring fetal assessment” or lack of fetal growth over a 3–4-week interval. For a singleton gestation with FGR, delivery is recommended between 38 0/7–39 6/7 weeks with no concurrent findings and between 34 0/7–37 6/7 weeks with concurrent findings including oligohydramnios, abnormal Doppler findings, or maternal comorbidities (e.g., preeclampsia).