Manual of
Genetics Fetal Medicine and Color Doppler

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Content

Chapter 2

Doppler in Fetal Growth Restriction

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DEFINITION OF SMALL FOR GESTATIONAL AGE

The most universally followed and accepted definition is estimated fetal weight (EFW) less than 10th centile or abdominal circumference (AC) less than 10th centile for the period of gestation.

In small for gestational age (SGA), it is important to differentiate between the constitutionally "healthy" SGA from pathologically growth restricted fetuses because perinatal morbidity and mortality differ vastly in these groups.

When Small for Gestational Age Diagnosed on Ultrasound (EFW/AC <10th Centile)

- Confirm dating by first trimester ultrasound
- Detailed anatomy scan to rule out chromosomal or genetic or infections as causes for the smallness (intrinsic)
- The Doppler examination to evaluate further.

DIFFERENTIATE BETWEEN HEALTHY SMALL FOR GESTATIONAL AGE AND FETAL GROWTH RESTRICTION

- Estimated fetal weight less than 3rd centile (excessive smallness) or
- Any Doppler abnormality—uterine (increased resistance)/cerebroplacental ratio [CPR = middle cerebral artery pulsatility index (MCA PI)/umbilical PI] abnormal (increased resistance in umbilical or decreased resistance in middle cerebral artery)—fetal growth restriction.

DIFFERENTIATE BETWEEN EARLY AND LATE ONSET FETAL GROWTH RESTRICTION (TABLE 1)

Early Onset Fetal Growth Restriction

- Onset before 32 weeks and delivery before 34 weeks

Table 1: Difference between early and late onset fetal growth restriction.

Early onset FGR	*Late onset FGR*
Challenge: Management	*Challenge:* Diagnosis
Prevalence: 1%	*Prevalence:* 3–5%
Severe placental disease: UA Doppler abnormal	*Mild placental disease:* UA Doppler normal
High association with PE	Low association with PE
Severe hypoxia: Systemic CV adaptation; DV abnormalities	*Mild hypoxia:* Central CV adaptation; MCA abnormalities
High mortality and morbidity	Lower mortality (but common cause of late stillbirth)

(FGR: fetal growth restriction; UA: umbilical arterial; PE: pulsatility index; MCA: middle cerebral artery)

- Often requires preterm delivery
- Typical pattern of worsening of umbilical and ductus venosus Doppler.

Late Onset Fetal Growth Restriction

- Less severe placental disease
- Could have minimal or no abnormality of umbilical artery Doppler, but evidence of redistribution evidenced by low CPR. Usually no venous Doppler abnormality.

ROLE OF UMBILICAL ARTERY DOPPLER

Monitoring umbilical PI in high-risk pregnancies (early onset intrauterine growth restriction), improves perinatal outcomes, and reduces deaths. Absent or reversed end-diastolic flow (AEDF or REDF) happen at least a week before acute deterioration: gives time for steroids, in utero transfer to higher center etc.

ROLE OF MIDDLE CEREBRAL ARTERY DOPPLER

Low PI in MCA indicated hypoxia and cerebral vasodilatation. These changes are a protective phenomenon but are a marker for poor perinatal and neurological outcome. MCA Doppler helps to identify adverse outcome in late onset fetal growth restriction (FGR) independent of umbilical Doppler.

ROLE OF DUCTUS VENOSUS DOPPLER

Strongest single parameter to predict the short-term risk of fetal death in early onset FGR. It becomes abnormal in severe stages of compromise, impending cardiac failure—causing absent or reversed "a" wave. It precedes loss of variability on nonstress test (NST) and poor biophysical profile (BPP) by 48–72 hours giving time for steroid administration.

STAGE-BASED PROTOCOL FOR MANAGEMENT OF SGA

Small Fetus (Fig. 1)

- Follow-up— 2 weekly growth and Doppler: Delivery—at 40 weeks if all normal.

Stage 1 FGR—Severe Smallness and Mild Placental Insufficiency

- Abnormal uterine or umbilical or MCA or CPR
- Follow-up—weekly: Delivery—37 weeks.

Stage 2 FGR—Severe Placental Insufficiency

- Absent end-diastolic flow in umbilical
- Follow-up—twice a week: Delivery—34 weeks, elective lower segment cesarean section (LSCS) acceptable.

Stage 3 FGR—Advanced Deterioration and Low Suspicion of Acidosis

- Reversed end diastolic flow (REDF) in umbilical, DV PI> 95th centile (positive a wave).

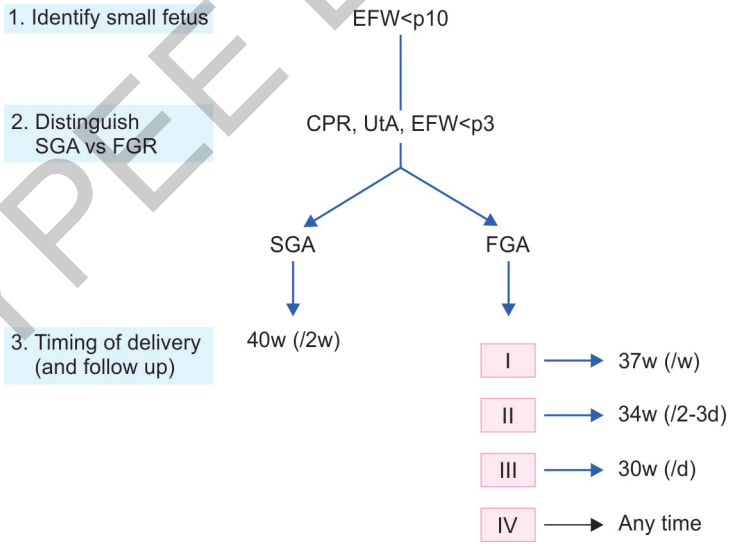

Fig. 1: Integrated protocol for the management of FGR.

(EFW: estimated fetal weight; SGA: small for gestational age; FGR: fetal growth restriction; CPR: cerebroplacental ratio; UtA: uterine artery)

Source: Figueras F, Gratacos E. An integrated approach to fetal growth restriction. Best Prac Res Clin Obstet Gynecol. 2017;38:48-58

- High risk of stillbirth and poor neurological outcome, but no sign of imminent death
- Follow-up—24–48 hourly: Delivery—30 weeks.

Stage 4 FGR—High Suspicion of Acidosis and Imminent Fetal Death

- Spontaneous decelerations, loss of short term variability, and reversed "a" wave on DV
- Intact survival chance 50% after 26 weeks gestational age (GA). Discussion with the neonatal team
- Follow-up—12 hourly: Delivery—LSCS after 26 weeks, steroid cover, and $MgSo_4$ for neuroprotection.

Maternal Conditions like Pulsatility Index Take a Priority in Delivery Timing Decisions

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