ISUOG Practice Guidelines

Management of Small-for-Gestational-Age Fetus and Fetal Growth Restriction

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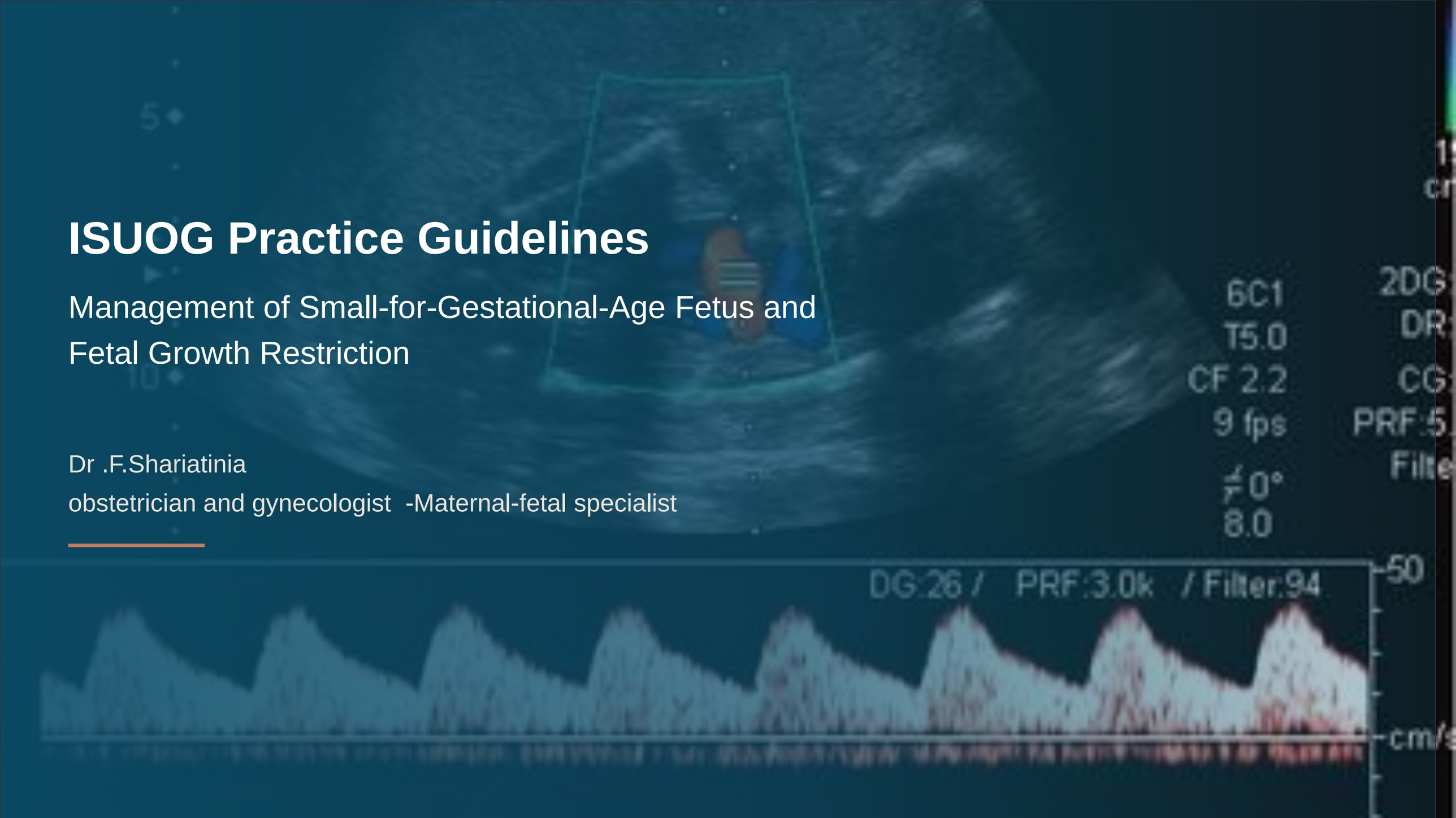
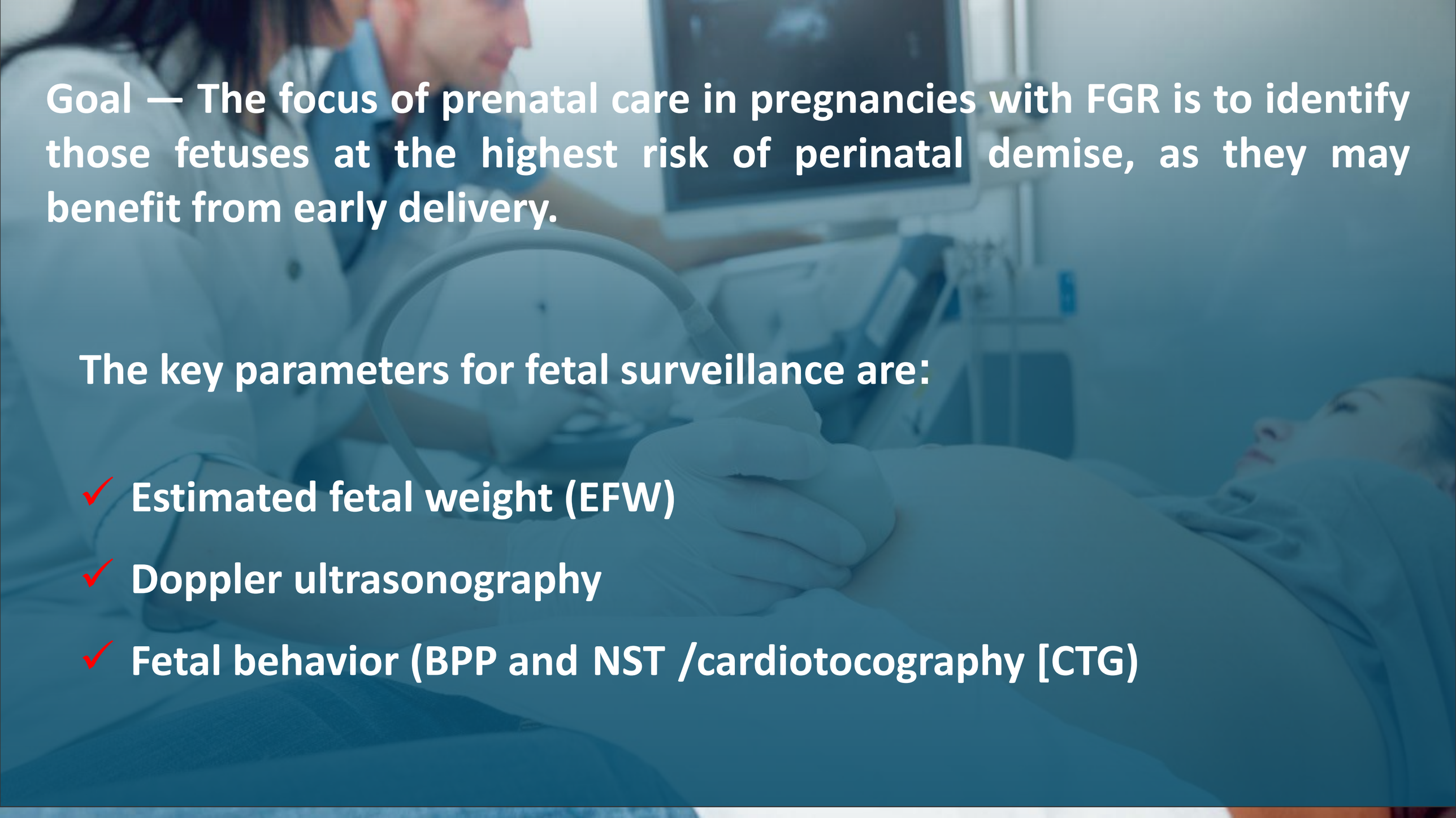
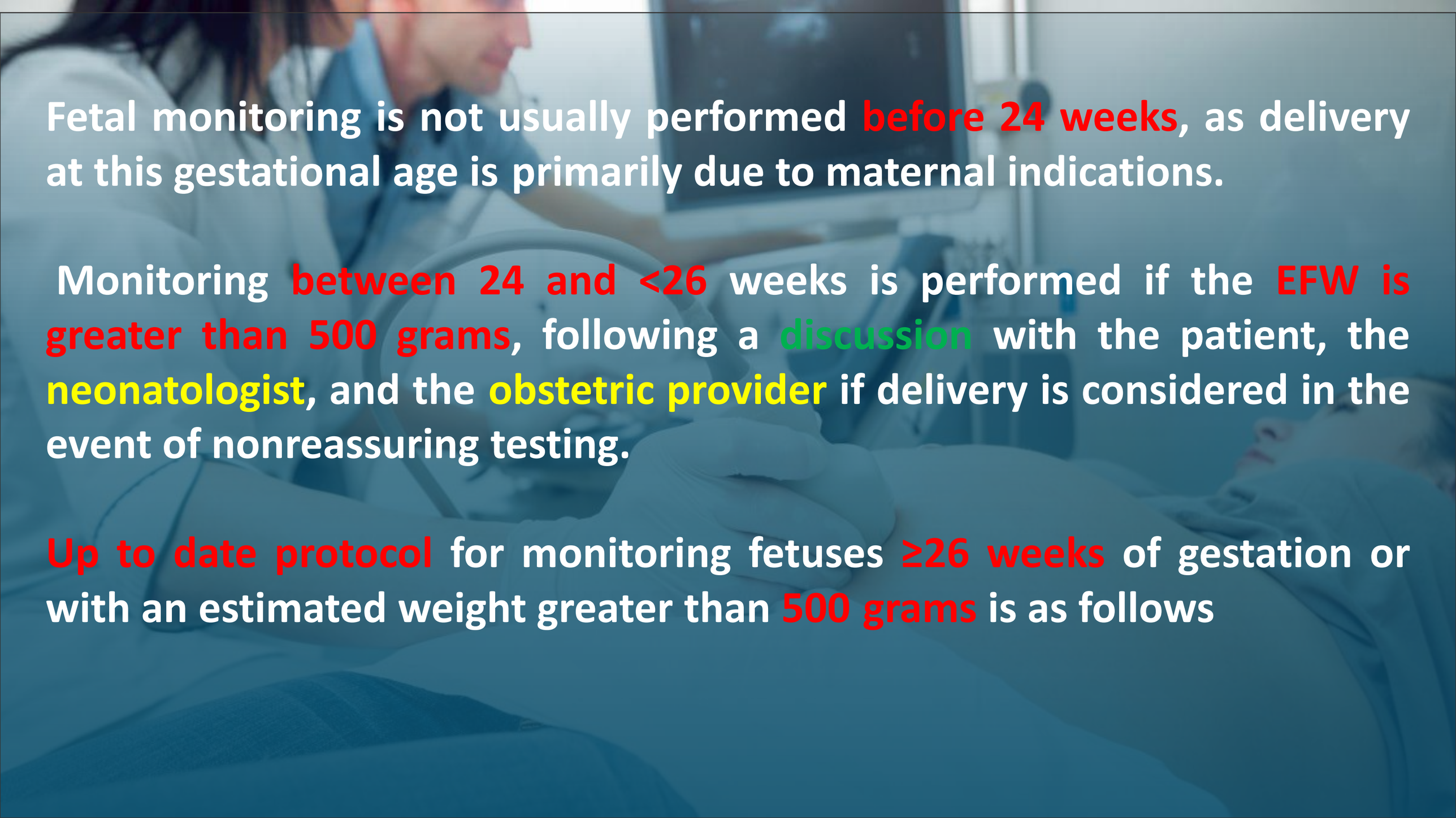




Goal — The focus of prenatal care in pregnancies with FGR is to identify those fetuses at the highest risk of perinatal demise, as they may benefit from early delivery.

The key parameters for fetal surveillance are:

- ✓ **Estimated fetal weight (EFW)**
- ✓ **Doppler ultrasonography**
- ✓ **Fetal behavior (BPP and NST /cardiotocography [CTG)**



Fetal monitoring is not usually performed before 24 weeks, as delivery at this gestational age is primarily due to maternal indications.

Monitoring between 24 and <26 weeks is performed if the EFW is greater than 500 grams, following a discussion with the patient, the neonatologist, and the obstetric provider if delivery is considered in the event of nonreassuring testing.

Up to date protocol for monitoring fetuses ≥26 weeks of gestation or with an estimated weight greater than 500 grams is as follows

The timing and route of delivery of pregnancies with FGR is based on a combination of factors, including Doppler findings, biophysical profile (BPP) score, nonstress test (NST)/cardiotocography (CTG) result, gestational age, and fetal weight

Between 26 and 29 weeks of gestation, each day in utero was estimated to improve survival by 1 to 2 percent in one study

When considering delivery for fetal indications, some authors have suggested a minimum threshold of 26 weeks of gestation, 500 g, or both.

Up todate 2026 fetal growth restriction :pregnancy management and outcom

Fetal Monitoring

The primary goal of fetal monitoring is the prevention of stillbirth by detecting fetal deterioration that precede irreversible compromise.

Multimodal assessment is recommended for the evaluation of pregnancies with suspected FGR. cCTG or BPP scoring should be used in combination with Doppler velocimetry (ISOUG)

Fetal surveillance tests include:

- **Fetal movement counting**
- **Fetal heart rate (FHR) monitoring with cardiotocography (CTG)**
- **Computerized CTG and short-term variation**
- **Ultrasound evaluation of amniotic fluid volume**
- **Biophysical profile (BPP) scoring**
- **Doppler velocimetry of umbilical artery, middle cerebral artery, and ductus venosus**

Maternal Monitoring

1. Regular blood-pressure assessment
2. monitoring of urinary protein/creatinine ratio
3. baseline renal–hepatic function in asymptomatic women
4. Maternal PlGF, SFIT testing

Maternal interventions:

no strong evidence that any intervention improves fetal growth and outcome:

- **Statins**
- **Phosphodiesterase-5 enzyme inhibitors**
- **maternal nutritional supplementation** (balanced protein energy bars, L-arginine, lipid-based nutrients), oxygen therapy, plasma volume expansion, nitroglycerin, bed rest, low-dose aspirin, anticoagulation)
- Patients with risk factors for or evidence of nutritional deficiencies (pregnancies complicated by bariatric surgery or eating disorders) may benefit from referral to a registered dietician
- **antihypertensive therapy** – In pregnant patients with chronic hypertension, antihypertensive therapy has maternal benefits but neither increases nor clearly decreases the risk of FGR

Fetal intervention

Antenatal corticosteroids

a course of antenatal betamethasone (or dexamethasone) is given to pregnancies <34+0 weeks of gestation in the seven days before preterm birth is anticipated.

Administration between 34+0 and 36+6 weeks does not appear to decrease the need for respiratory support and increases the rate of neonatal hypoglycemia .
The administration of antenatal corticosteroids, including the potential harms on neurodevelopment

Three studies observed that growth-restricted fetuses with absent end-diastolic flow often show transient improvement in blood flow after betamethasone administration.

Fetal intervention

Magnesium Sulphate:

Magnesium sulfate for neuroprotection – Magnesium sulfate is administered for neuroprotection in pregnancies <32 weeks.

decrease in significant neurodevelopmental impairment and death, CP,IVH 3,4 was seen

4 -6 g intravenously over 20 min followed by maintenance dose of 1-2 g /hour
Should be initiated within 24 hours before birth

Up todate

UA and MCA Doppler = **normal** (UA PI ≤95 and MCA PI ≥5 percentile):
UA and MCA Doppler tests with a BPP = weekly intervals

UA or MCA Doppler = **abnormal**, but the UA has diastolic flow (UA PI >95 and or MCA PI <5 percentile), the amniotic fluid volume is normal, no maternal or fetal comorbidities:
UA and MCA Doppler tests are performed twice a week.
BPP is performed during one of the visits, and an NST is performed during the other visit

abnormal UA or MCA Doppler with **comorbidities** (oligohydramnios, preeclampsia)
admitted to the hospital. Reevaluation After 24-hour.

UA Doppler shows absent or reversed diastolic flow:

admitted to the hospital for convenient access to frequent fetal surveillance
NSTs are performed **every 12 hours**
BPP is performed **daily**
UA and MCA Doppler are performed **two to three times per week**

Patients with a nonreactive NST or BPP <8/10 –
Management depends on the specific findings and gestational age.

In all cases in which delivery for nonreassuring fetal testing is generally indicated but would result in the birth of an extremely preterm neonate, patients should receive comprehensive counseling on neonatal morbidity and mortality by a team including the primary obstetric provider, maternal-fetal medicine, and neonatology services as part of shared decision-making about delivery timing, route of delivery, and neonatal resuscitation.

At any gestational age, deliver if one of the follow is present:

- Repetitive late decelerations – Prompt delivery is indicated.
- **0 or 2/10: This is a very abnormal score with a high risk of fetal death These pregnancies should be delivered.**
- **-4/10: This is an abnormal score The BPP generally should be repeated in one hour. If still 4/10, then delivery is often indicated**
- **6/10 without oligohydramnios or 8/10 with oligohydramnios (maximum vertical pocket <2 cm):**

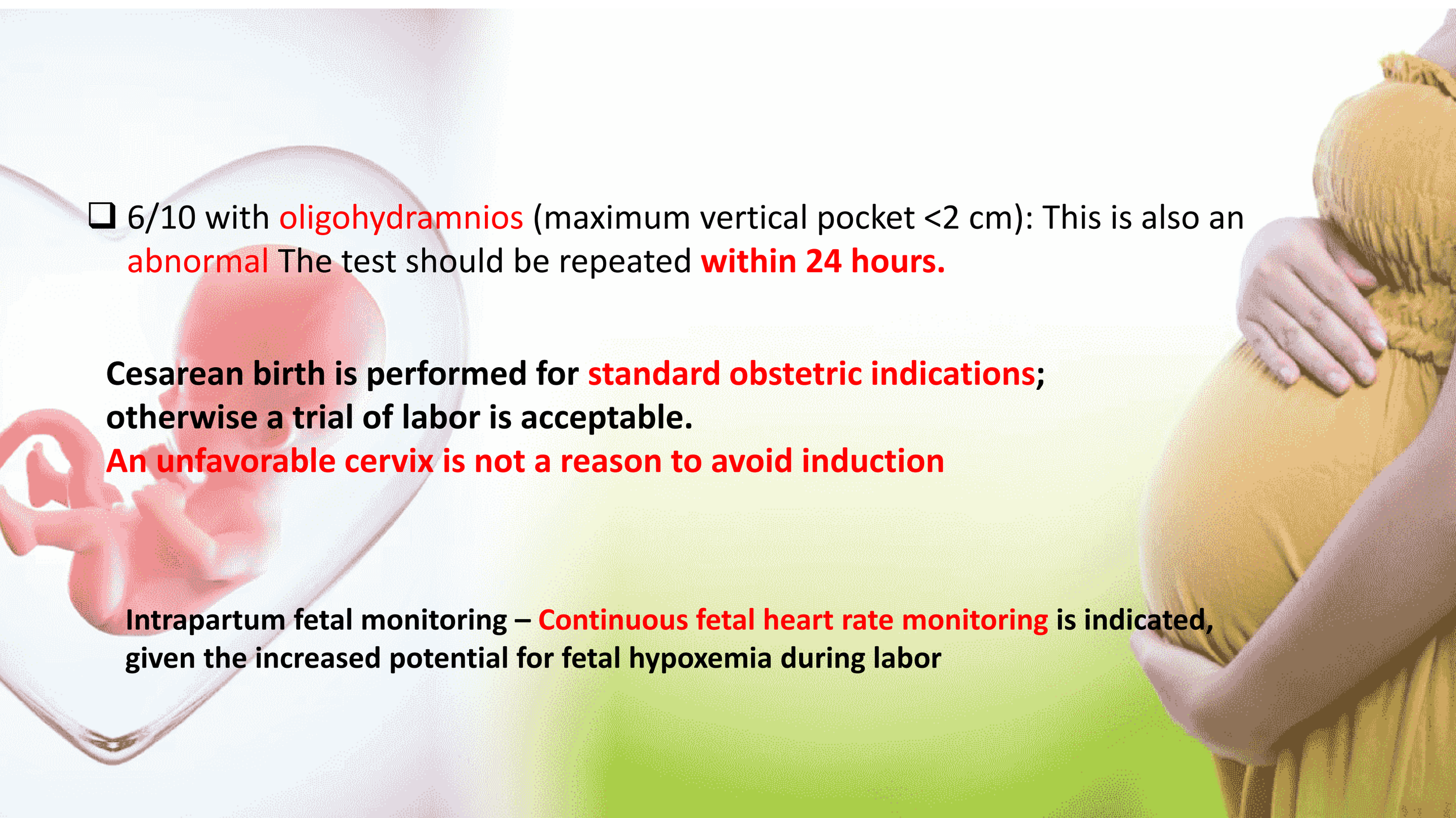
These are equivocal scores

The decision to deliver is individualized based on the results of additional testing (NST, repeated BPP), maternal status, gestational age, and severity of Doppler findings (UA, DV).

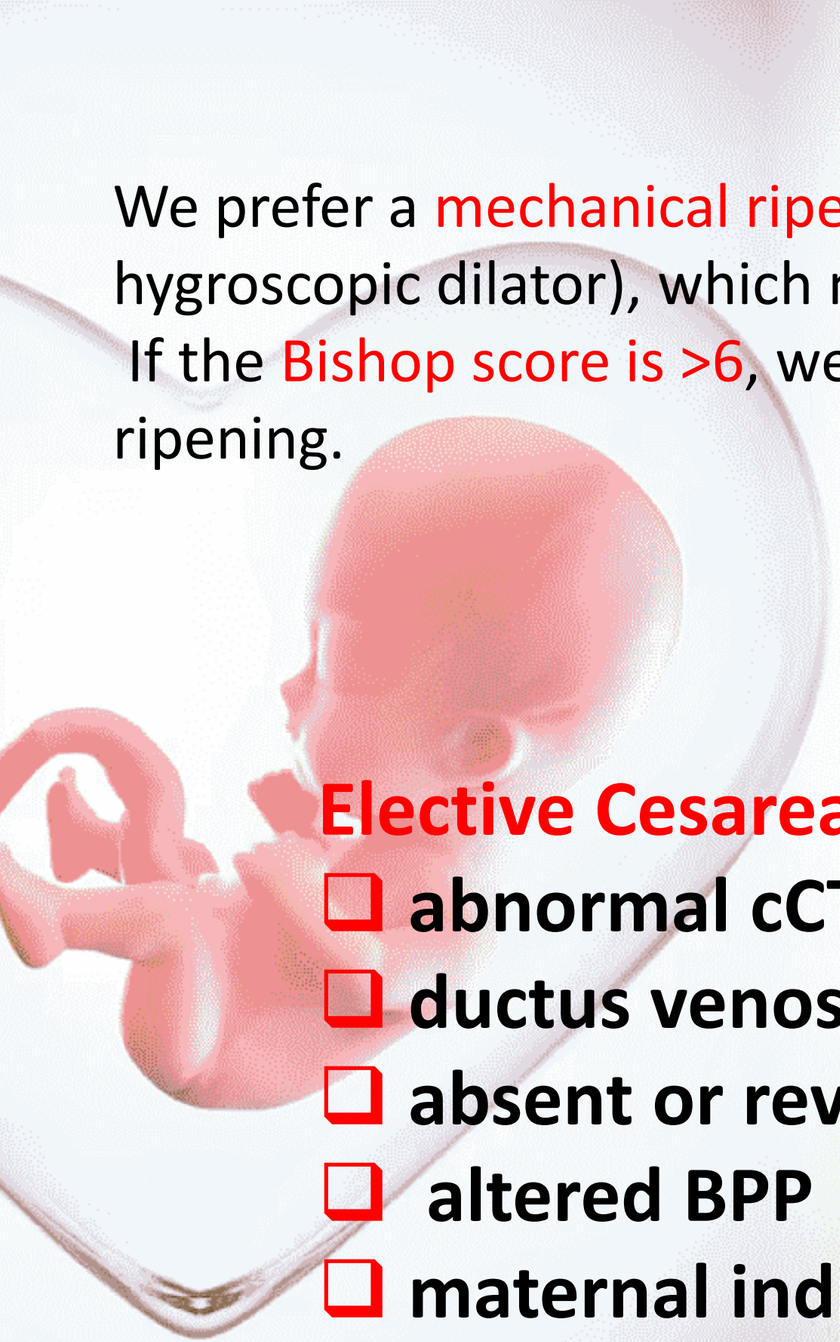
- 6/10 with oligohydramnios (maximum vertical pocket <2 cm): This is also an abnormal The test should be repeated **within 24 hours.**

Cesarean birth is performed for standard obstetric indications; otherwise a trial of labor is acceptable.
An unfavorable cervix is not a reason to avoid induction

Intrapartum fetal monitoring – Continuous fetal heart rate monitoring is indicated, given the increased potential for fetal hypoxemia during labor



We prefer a mechanical ripening method (insertion of a balloon catheter or hygroscopic dilator), which may be safer than prostaglandins in this setting . If the Bishop score is >6, we administer oxytocin without mechanical ripening.



Elective Cesarean delivery is recommended :

- ❑ **abnormal cCTG STV**
- ❑ **ductus venosus Doppler alteration**
- ❑ **absent or reversed UA-EDF**
- ❑ **altered BPP**
- ❑ **maternal indication**

Absolute criteria requiring delivery (independent of gestational age)

- 30-minute BPP score of 0 or 2(pH of less than 7.20)
- repetitive fetal heart rate decelerations
- sinusoidal heart rate
- absent variability with recurrent late decelerations or fetal bradycardia
- in computerized CTG STV below 2.6 ms is below the 5th percentile irrespective of gestational age.
- Pre-eclampsia with uncontrolled hypertension
- HELLP syndrome
- other evidence of end-organ damage

SLCOG Guideline March 2023

UA Doppler indices	Additional patient considerations	Recommended timing for delivery
Normal	FW ≥3 and <10 percentile and no comorbidities	38+0 to 39+0 weeks
	EFW ≥3 and <10 percentile and oligohydramnios or comorbidities (preeclampsia, chronic hypertension)	Individualize timing, but 34+0 to 37+6 weeks for most patients
	EFW <3 percentile and no comorbidities	37+0 and 37.6weeks
Abnormal (>95 percentile)	reactive NST and BPP score 8/8, 10/10 or 8/10 with normal amniotic fluid volume:	37+0 and 37.6 weeks
Absent diastolic flow	reactive NST and BPP score 8/8, 10/10 or 8/10 with normal amniotic fluid volume:	33+0 to 34+0 weeks
Reversed diastolic flow	reactive NST and BPP score 8/8, 10/10 or 8/10 with normal amniotic fluid volume:	30+0 to 32+0 weeks

Monitoring Early-Onset FGR: The TRUFFLE Approach

Setting & Team

- Tertiary-level fetal medicine and neonatal units
- Multidisciplinary counseling (neonatology + MFM)

Monitoring Modalities (Grade A)

- **UA, MCA, and ductus venosus** Doppler
- **cCTG with STV** as main parameter
- BPP scoring where undertaken
- Conventional CTG if cCTG unavailable

Monitoring Frequency

- Based on severity of FGR and UA abnormalities
- **Every 2–3 days** for absent/reversed UA-EDF

Maternal Monitoring

- Regular blood pressure assessment
- Urinary protein/creatinine ratio
- Baseline renal-hepatic function
- **70%** develop hypertensive disorders

Interventions

Corticosteroid Prophylaxis (Grade B)

Recommended if delivery likely before 34+0 weeks. Enhanced surveillance during administration for absent/reversed UA-EDF.

Magnesium Sulfate

For fetal neuroprotection if preterm delivery expected. Refer to local/national guidelines for GA thresholds.

Delivery Timing in Early-Onset FGR

Gestational Age	Delivery Criteria	Additional Notes
Any GA	Maternal indication (severe pre-eclampsia, HELLP) or obstetric emergency	Good Practice Point
24+0 to 25+6	Personalized management	Good Practice Point
26+0 to 28+6	DV a-wave at/below baseline or STV < 2.6 ms	Grade A
29+0 to 31+6	DV a-wave at/below baseline or STV < 3.0 ms	Grade A
32+0 to 33+6*	Reversed UA-EDF or STV < 3.5 ms	Good Practice Point
≥ 34+0 wks**	Absent UA-EDF or STV < 4.5 ms	Good Practice Point

Elective Cesarean if abnormal cCTG STV, DV Doppler alteration, absent/reversed UA-EDF, altered BPP, or maternal indication.

TRUFFLE study: 82% survival without neurological impairment.

Late-Onset FGR: Monitoring & Delivery

Key Monitoring Parameters

- **MCA-PI** and ratios to UA-PI (CPR, UCR) are key
- Median interval low MCA-PI to stillbirth: **≤ 5 days**
- UA-PI > 95th percentile: monitor **1-2x per week**
- Confirm MCA-PI alteration **within 24 hours**

DIGITAT Trial Key Finding

Induction of labor for suspected FGR **after 38 weeks** was not associated with increased Cesarean section or adverse neonatal outcome.

However, more neonates with birth weight **< 3rd percentile** were in the expectant arm.

Delivery Recommendations

Gestational Age	Delivery Indication	Evidence Level
36+0 to 37+6	UA-PI > 95th percentile or AC/EFW < 3rd percentile	Good Practice Point
38+0 to 39+0	Cerebral blood-flow redistribution	Good Practice Point
Any GA	Absent/reversed UA-EDF, altered BPP, maternal indication	Good Practice Point

Induction of labor is indicated if no contraindications. Continuous fetal heart rate monitoring during labor is recommended.

Small-for-Gestational Age: Management

SGA is often considered constitutionally small with normal Doppler. However, recent evidence suggests SGA with normal Doppler may still have accelerated placental aging, lower umbilical vein blood flow, and greater incidence of Cesarean for fetal distress. Some SGA fetuses may suffer from "stunted" growth not identifiable by standard tools.

Monitoring Protocol

- Doppler (UA-PI, MCA-PI, CPR, UCR) at diagnosis and follow-up
- Uterine artery Doppler at diagnosis (no repeat needed)
- Fortnightly growth, weekly Doppler
- Abnormal UtA-PI: higher risk of brain sparing progression

Delivery Recommendation (Grade A)

- Delivery should be planned from 38+0 weeks
- Pregnancy should not exceed 39+0 weeks
- Induction of labor appropriate depending on clinical situation
- Continuous fetal heart rate monitoring during labor

Rationale for 38-39 Week Delivery

- Major cause of perinatal death at term is stillbirth
- Some SGA fetuses may have stunted growth not identified by current biophysical tools
- Supported by DIGITAT trial findings and population studies on induction at term

رحم کوچکتر از سن حاملگی

ارتفاع رحم بیش از ۳ هفته با سن بارداری متفاوت است.

- ✓ محاسبه سن جنین براساس LMP و سونوگرافی های قبلی
- ✓ اخذ شرح حال مادر: از نظر وضعیت تغذیه و وزن گیری، بیماری های سیستمیک، سابقه وزن نوزاد قبلی، بیماری های عفونی (TORCH، سیتومگالوویروس، ...)، شکایت از آبریزش
- ✓ سمع دقیق قلب جنین
- ✓ انجام سونوگرافی جهت بررسی GA، حجم مایع آمنیوتیک، فعالیت جنینی

جنین کوچکتر از سن حاملگی

نشنیدن صدای قلب جنین

تأیید IUFD توسط سونوگرافی

مراجعه به الگوریتم مرگ جنین ص ۱۱۱

SGA

منحنی رشد جنین ۱۰-۳ ٪ داپلر ها و مایع آمنیوتیک طبیعی

سونوگرافی بیومتری هر دو هفته یکبار و داپلر بند ناف ۲-۱ هفته یکبار و MCA و بیوفیزیکال پروفایل یا NST ۲-۱ هفته یکبار تا ۳۷ هفته سپس هر هفته تا زمان زایمان

القاء زایمان در ۳۸ تا ۳۹ هفته بارداری

FGR

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کاهش حجم مایع آمنیوتیک

الیگو هیدر آمنیوس

گرفتن تاریخچه دقیق از نظر پارگی کیسه آب

پارگی زودرس کیسه آب

مراجعه به الگوریتم پارگی زودرس کیسه آب.ص ۶۰

آنومالی های توجیه کننده الیگوهیدرآمینوس

تصمیم گیری با توجه به نوع آنومالی

FGR

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در سن بارداری کمتر از ۳۲ هفته: Early FGA	در سن بارداری مساوی یا بیشتر از ۳۲ هفته: Late FGR
– اندازه دور شکم (AC) یا وزن تخمینی جنین کمتر از ۳٪ یا فقدان جریان خون پایان دیاستولی (AEDF) در داپلر شریان نافی – اندازه دور شکم (AC) یا وزن تخمینی جنین کمتر از ۱۰٪ به همراه یکی از موارد زیر: o PI متوسط شریان رحمی بیش از ۹۵٪ یا o PI متوسط شریان نافی بیش از ۹۵٪	– اندازه دور شکم (AC) یا وزن تخمینی جنین کمتر از ۳٪ و یا – وجود حداقل دو معیار زیر: o اندازه دور شکم (AC) یا وزن تخمینی جنین کمتر از ۱۰٪ o کاهش صدک اندازه دورشکم و وزن تخمینی جنین به میزان دو چارک o نسبت PI شریان مغزی میانی به PI شریان نافی (CPR) کمتر از ۵٪ یا PI شریان نافی بیش از ۹۵٪

مدیریت FGR

مرحله	پاتوفیزیولوژی	معیار (هر کدام از)	ارزیابی (حداقل فاصله زمانی)	زمان ختم بارداری	نوع زایمان
I IUGR	کوچکی شدید و یا نارسایی خفیف جفت	EFW<3rd centile Or AC<3% AF normal Doppler normal	– سونوگرافی بیومتری هر دوهفته یکبار – داپلر هفته ای ۲-۱ بار – بیوفیزیکال پروفایل یا NST از ۳۷ هفته دوبار در هفته تا زمان زایمان	۳۸-۳۷ هفته	القای زایمان
I IUGR	نارسایی خفیف جفت	CPR<P5 UA PI>P95 MCA PI<P5 UtA PI>P95	–تزریق کورتیکوستروئید داپلر، بیوفیزیکال پروفایل یاNST ۲-۱بار در هفته تا زمان زایمان سونوگرافی بیومتری هر دوهفته یکبار	۳۷-۳٦ هفته در صورت اولیگو هیدرآمنیوس پره اکلامپسی و توقف وزن گیری ختم باردرای ۳۷-۳٤ هفته	القای زایمان
II IUGR	نارسایی شدید جفت	UA AEDF	–داپلر و بیوفیزیکال پروفایل دو بار در هفته – NST روزانه	۳٤ هفته	سزارین
III IUGR	زوال پیشرفته جنین ، احتمال کم اسیدوز جنین	UA REDF DV PI>p95	–داپلر، بیوفیزیکال پروفایل و cCTG حداقل هر ٤٨– ۲٤ ساعت	۳۲-۳۰ هفته	سزارین
IV IUGR	احتمال بالای اسیدوز جنین و خطر بالای مرگ جنین	DV reverse a flow FHR decelerations	مانیتورینگ مستمر ضربان قلب جنین	۳۰۲٦ هفته	سزارین

توضیحات:

-در صورت انجام زایمان واژینال مانیتورینگ الکترونیک دائم انجام شود. حضور متخصص اطفال هنگام زایمان ضروری است.

-ارزیابی های جدول بالا در صورتی انجام شود که وزن جنین از ۵۰۰ گرم بیشتر باشد

-در صورت تشخیص FGR ارزیابی آنومالی جنین، تاریخچه دقیق مادر، پیشنهاد تست ژنتیک در صورت early FGR ،وجود ناهنجاری، پلی هیدرآمنیوس و آزمایش TORCH انجام شود.

-در صورت cCTG اندیکاسیون قطعی زایمان است .

-در صورت FHR Deceleration سزارین انجام شود.

-در صورت نبودن cCTG از NST استفاده شود.

GROWTH RESTRICTION AND DISCORDANCE in twin pregnancy

EFW or Abdominal circumference <3 percentile of one twin

Or

At least two of the following:

EFW <10 percentile for one twin

Abdominal circumference <10 percentile for one twin

UA pulsatility index (PI) >95 percentile for the smaller twin

Weight discordance ≥25 percent

The management of growth restriction and/or discordance depends on chorionicity.

Dichorionic twins :

Growth restriction is generally managed as in singletons timed delivery based on combination of factors (gestational age, umbilical artery Doppler, BPP score, ductus venosus Doppler, and the presence or absence of risk factors for, or signs of uteroplacental insufficiency)

CLASSIFICATION:

The pattern of the umbilical artery (UA) waveform and end-diastolic velocity of the smaller fetus are used to classify sFGR into three types

Type 1 sFGR —persistently forward UA end-diastolic velocity without variation in the waveform and with normal or elevated resistance

Type 2 sFGR —fixed absent or fixed reversed UA end-diastolic velocity without variation of the waveform in the smaller twin.

Type 3 sFGR —a pathognomonic UA waveform that has a variable flow pattern that cycles between forward, absent, and reversed flow over a short interval

Type 1:

Expectant management with weekly umbilical artery ,middle cerebral artery beginning at diagnosis Weekly biophysical profile scoring (BPP) is added at 28 to 32 weeks.

If the UA PI >95 percentile or the MCA PI <5 percentile, we would increase surveillance to **twice weekly** and also monitor for abnormalities in the ductus venosus (DV) waveform.

Timing of delivery –34+0 to 35+6 weeks

Type 2 and 3 sFGR:

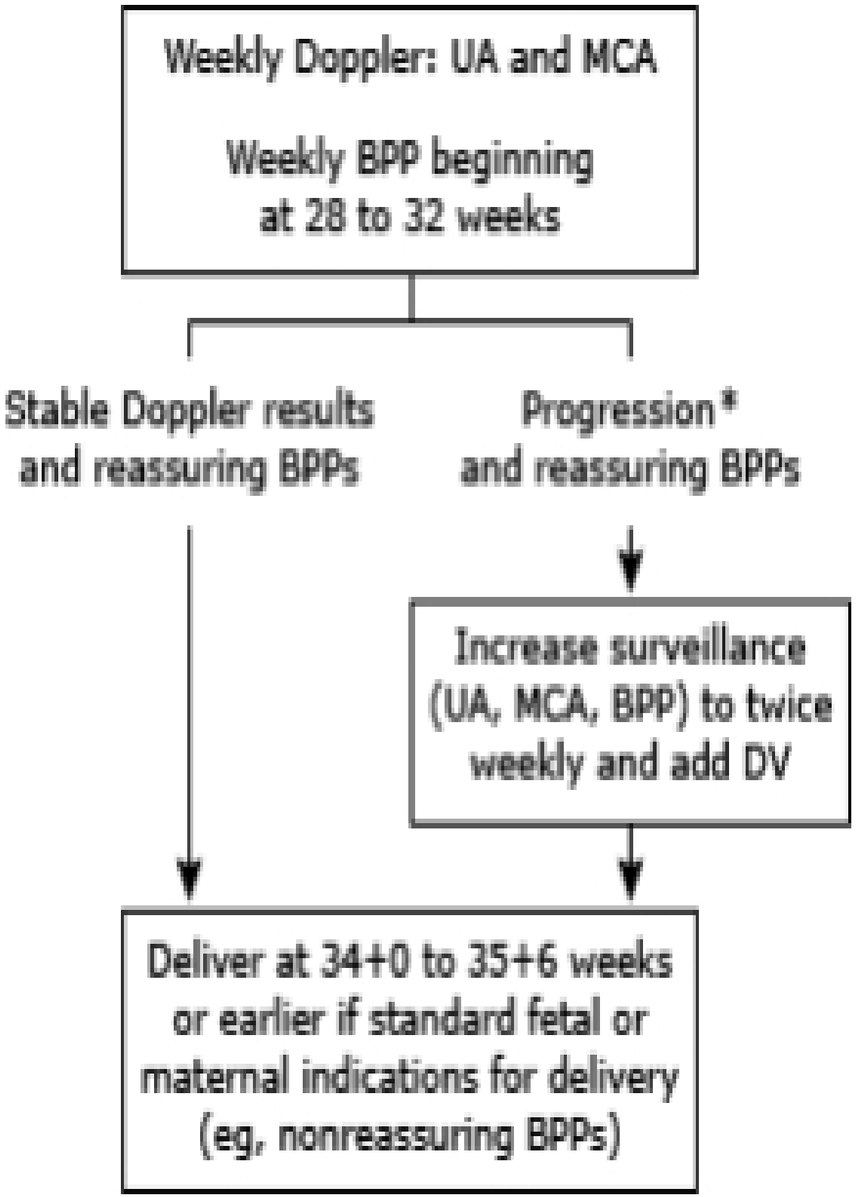
Ultrasound surveillance (UA, MCA, and DV) is performed at least weekly beginning at diagnosis, with a weekly Bpp added at 28 weeks

Timing of delivery –

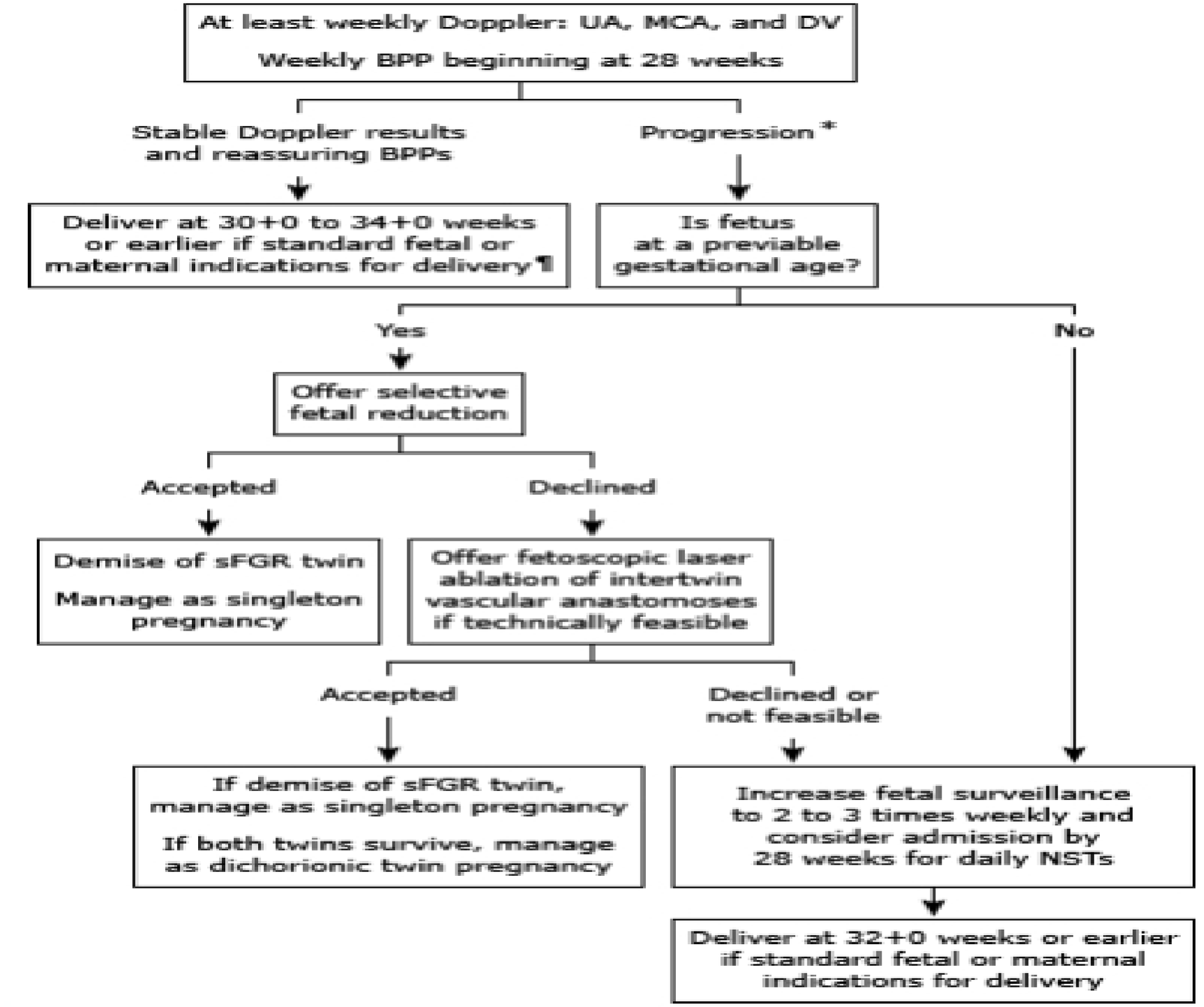
UA reversed end-diastolic flow at 30+0 to 32+0 weeks

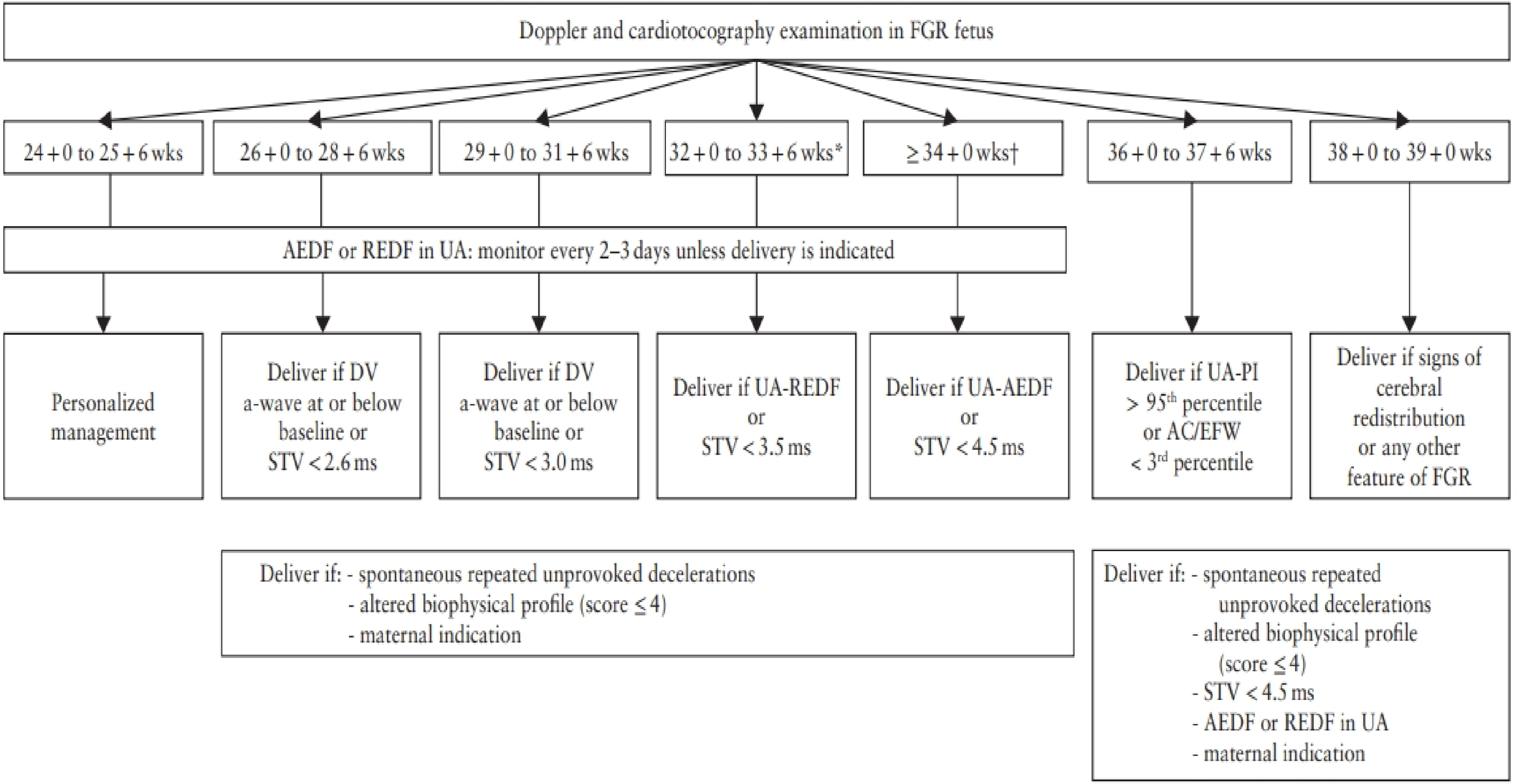
UA absent end-diastolic flow at 32+0 to 34+0 weeks

Pregnancy management after diagnosis of type 1 sFGR



Pregnancy management after diagnosis of type 2 and type 3 sFGR




Doppler and cardiotocography examination in FGR fetus
24 + 0 to 25 + 6 wks
26 + 0 to 28 + 6 wks
29 + 0 to 31 + 6 wks
32 + 0 to 33 + 6 wks*
≥ 34 + 0 wks†
36 + 0 to 37 + 6 wks
38 + 0 to 39 + 0 wks
AEDF or REDF in UA: monitor every 2–3 days unless delivery is indicated
Personalized management
Deliver if DV a-wave at or below baseline or STV < 2.6 ms
Deliver if DV a-wave at or below baseline or STV < 3.0 ms
Deliver if UA-REDF or STV < 3.5 ms
Deliver if UA-AEDF or STV < 4.5 ms
Deliver if UA-PI > 95th percentile or AC/EFW < 3rd percentile
Deliver if signs of cerebral redistribution or any other feature of FGR
Deliver if: - spontaneous repeated unprovoked decelerations
- altered biophysical profile (score ≤ 4)
- maternal indication
Deliver if: - spontaneous repeated unprovoked decelerations
- altered biophysical profile (score ≤ 4)
- STV < 4.5 ms
- AEDF or REDF in UA
- maternal indication