Investigation and management of the small for gestational age fetus

Siân Bullough

BSc (Hons), MBChB, MRCOG (Hons)

Harris Wellbeing Research Centre, University of Liverpool and Liverpool Women’s Hospital, members of Liverpool Health Partners, United Kingdom

[sian.bullough@liverpool.ac.uk](about:blank)

0151 795 9550

Kate Navaratnam

MBChB(Hons), PhD, MRCOG

Harris Wellbeing Research Centre, University of Liverpool and Liverpool Women’s Hospital, members of Liverpool Health Partners, United Kingdom

Kate.Navaratnam@liverpool.ac.uk

0151 795 9567

Andrew Sharp

BSc (Hons), PhD, MBBS, MRCOG

Harris Wellbeing Research Centre, University of Liverpool and Liverpool Women’s Hospital, members of Liverpool Health Partners, United Kingdom

a.sharp@liverpool.ac.uk

0151 795 9550

Conflict of Interests: None to declare

Abstract

The desire to identify the small for gestational age fetus is due to its association with stillbirth and poorer neonatal outcomes. The difficulty lies in determining which of these babies are just constitutionally small and healthy and which are growth restricted fetuses that are at significant risk of poor outcomes. Fetal growth restriction is often mediated through placental disease and shares a similar aetiological pathway to preeclampsia. Placental malperfusion results in impaired nutrient and oxygen delivery to the fetus. Appropriate risk assessment in early pregnancy and monitoring with symphysis fundal height measurement or ultrasound scans is a crucial part of the screening pathway. There is no effective treatment for growth restriction so management is based on close monitoring and early delivery. Fetal growth restriction has better defined monitoring and delivery timing guidelines whereas it is more unclear and variable for fetuses considered only to be small for gestational age.

Key Words: small for gestational age; fetal growth restriction; intrauterine growth restriction

(A) Background

Due to its association with stillbirth there has been increasing concern about identifying the growth restricted fetus. One third of stillbirths are growth restricted making fetal growth one of the biggest risk factors for stillbirth. Unfortunately, preventing stillbirth in the small fetus remains a significant clinical challenge as the majority are healthy and at minimal risk.

We cannot directly weigh the fetus and so estimations of fetal weight are made using biometric features identifiable on ultrasound; head circumference (HC), abdominal circumference (AC) and femur length (FL). This information is then used in a mathematical formula to determine an estimated fetal weight (EFW). The EFW is then plotted on a fetal growth chart that over sequential scans allows a dynamic assessment of fetal growth over time. When a fetus is plotted less than the 10th centile for gestational age it is termed small for gestational age (SGA). SGA is most commonly defined as a fetus with an EFW or AC less than the 10th centile. This review will discuss the management of singleton pregnancies complicated by SGA.

(B) Centile Charts

The most widely adopted centile chart in the UK is the customised growth chart produced by the Perinatal Institute. There is limited evidence to support use of a particular chart but customisation is currently advised by the Royal College of Obstetrician and Gynaecologists (RCOG). The gestation-related optimal weight (GROW) chart uses maternal characteristics such as height, weight, ethnicity and parity to generate a centile chart unique to that woman. There are however, valid alternative approaches such as population centile and standard centile charts. Population centile charts, such as the Chitty chart, are designed to be applied to the specific population from which they were developed. Standard charts, include Intergrowth-21 and WHO charts have been developed to standardise the expected fetal growth from a healthy woman and fetus. There is widespread ongoing debate about which of these centile charts is the most appropriate, each with their individual merits and limitations. A more recent guideline released by NHS England in 2019, Saving Babies’ Lives Version Two (SBLV2), does not recommend a particular chart above others available.

(B) Definitions

The majority of SGA fetuses, up to 70%, are appropriately grown, healthy and not at substantially increased risk of stillbirth. These are considered to be constitutionally small, and usually fall between the 3rd – 10th centile. The rest may have a pathological process driving the poor growth that is preventing the fetus achieving its growth potential. This is described as fetal growth restriction (FGR), previously known as intrauterine growth restriction (IUGR) or severe SGA. It can be challenging to diagnose, as a single measure of fetal size only defines its current weight not its growth potential. As with SGA there have been many different definitions and criteria used to describe FGR. The RCOG uses the cut off of an EFW or AC less than the 3rd centile to define FGR. More recently a panel of international experts using the Delphi procedure proposed a new definition for early and late FGR (Table 1).

Table 1

(B) Incidence

10% of all pregnancies will be identified as SGA with about 40% of SGA fetuses undiagnosed before birth. 30% of all SGA babies will have a more extreme growth restriction of FGR. Early onset FGR complicates 30% of all FGR cases or just 0.5% of all pregnancies.

(B) Pathophysiology

The vast majority of FGR is mediated through placental disease, certainly in the context of early onset disease, and shares a similar aetiological pathway to preeclampsia. Up to 70% of FGR pregnancies will also develop preeclampsia. Placental dysfunction originates from inadequate trophoblast invasion and maladaptation of maternal spiral arteries to create a high-resistance circulation rather than the desired low resistance vascular bed.This leads to utero-placental malperfusion and impaired nutrient and oxygen delivery to the fetus, termed placental insufficiency.

Figure 1

(A) Impact

(B) Fetal

* Short Term

SGA fetuses, principally those with FGR, are at higher risk of stillbirth and neonatal morbidity than those appropriate for gestational age (AGA). Up to 30% of late 3rd trimester stillbirths are associated with, often unrecognised antenatally, FGR or SGA. As our only current management for SGA is early delivery these babies are exposed to the additional risks of prematurity. FGR babies born prematurely have a greater neonatal mortality than their AGA counterparts. SGA babies born from 37 weeks have greater morbidity compared to those born after 39 weeks.

* Medium Term

Early term deliveries are not risk free. There is an increased risk of cerebral palsy, adverse neurodevelopmental outcomes, behavioural difficulties and reduced intellectual attainment.

* Long Term

The long-term risks for the SGA baby are influenced by the inter-play between genetics and in-utero environmental factors in a process termed fetal programming. In response to hypoxic stress there is remodelling of the fetal cardiovascular system. The fetus becomes at greater risk of developing metabolic syndrome, thus increasing the risk of cardiovascular disease and stroke in later life.

(B) Maternal

* Short Term

A woman with an SGA fetus is at increased risk of developing preeclampsia and the complications that come with this diagnosis. In the attempt to prevent stillbirth there is a concern that we may be unnecessarily increasing interventions for women, such as induction of labour and caesarean sections, and restricting a woman’s autonomy and birth choices.

* Long Term

It has now been widely accepted, and incorporated into multiple national guidelines, that the development of preeclampsia increases a woman’s future risk of death from cardiovascular disease. There is growing evidence to suggest that a similar pattern may be observed in women with an SGA baby, as the offspring birth weight is related to maternal lifespan, through an association with cardiovascular mortality in later life.

(A) Screening

Due to the elevated risks associated with SGA and the national drive to reduce preventable stillbirth, identifying pregnancies at risk of SGA has become a leading strategy in recent years.

(B) Pregnancy Dating

It is crucial that the pregnancy is dated accurately. This will therefore ensure the symphysis fundal height (SFH) and EFW is interpreted correctly. Dating should be based on ultrasound measurement of the crown-rump length (CRL) between 8 – 14 weeks. In cases where this has not been possible, once the CRL is over 84mm the HC is the measurement of choice and from 18 weeks onward a combination of HC and FL can be used.

(B) Risk Assessment

All assessments must begin by accurately establishing any risk factors for SGA at the booking appointment. This allows women to be triaged into the correct surveillance pathway. The initial risk factor assessment tool created by the RCOG used an odds ratio (OR) cut-off of 2 to demarcate between a risk factor being considered minor (<2) or major (≥2). One major risk factor defines a high-risk monitoring pathway whilst three minor risk factors an intermediate-risk pathway. This has since been updated and streamline by NHS England where the presence of only 1 risk factor is required (Table 2).

Table 2

It is important to highlight to a woman that if she is able to stop smoking before 16 weeks gestation her risk of adverse pregnancy outcome returns to that of a non-smoker. On-going risk assessment throughout the pregnancy should be practiced as a woman’s risk can evolve in response to the development of pregnancy complications, such as hypertension, diabetes and bleeding.

(B) Biomarkers

There is no current biomarker, or biomarker combination able to accurately discriminate women at high-risk of an SGA fetus. There is some evidence that low PAPP-A in the 1st trimester is associated with an SGA fetus and this has been incorporated as a high risk factor in both the RCOG and SBLV2 guidelines.

(B) Examination

Abdominal palpation is not an appropriate screening method for an SGA fetus. Women who are considered low-risk for an SGA fetus should have symphysis fundal height (SFH) measurements from 24 weeks with measurements repeated every 2-3 weeks. It is important that all health care professionals measuring SFH are appropriately trained in a standardised approach. The Perinatal Institute outline the practice of measuring SFH adopted in the UK and this can be found on their website (https://www.perinatal.org.uk/FetalGrowth/FundalHeightMeasurement).

A reduced SFH measurement should instigate ultrasound assessment to confirm or refute the suspicion of SGA. Indications for a growth scan when using the GROW customised chart include:

* Single SFH plot below the 10th centile
* Serial SFH measurements that suggest slowing growth (slope of the growth trajectory flatter than the 10th centile line)
* Serial (two) static SFH measurements

(B) Uterine Artery Dopplers

The uterine artery Doppler assessment allows interogation of uteroplacental function. It gives an impression of the adaptive response of the uterine vessels to placentation and a poor response, of high resistance, would suggest a woman is at increased risk of SGA. Screening utilising uterine artery Dopplers was first advocated in the RCOG SGA guidance in 2013. This has since been further developed in SBLV2. As part of the high-risk pathway, women have uterine artery Doppler assessment between 20-24 weeks. The presence of an abnormal uterine artery Doppler, defined as a raised mean pulsatility index (PI) >95th centile and/or notching, increases surveillance for SGA.

Figure 2

(A) Diagnosis

(B) How to Confirm SGA

Ultrasound is our most effective method to estimate fetal weight in utero. However, there is an inherent degree of inaccuracy in ultrasound estimation of fetal weight, which increases with gestation, generally 10-15% but up to 20% at term. This means that actual fetal weight could be reported as 2000g to 3000g for a true weight of 2500g, which may drive further surveillance and earlier obstetric intervention. The other important consideration is that fetal growth is not static. Therefore the weight at the time of a scan is not perfectly predictive of weight at a later point.

(B) Determining EFW

Sonographers and clinicians must be appropriately trained in the principles and techniques to perform ultrasound assessment of fetal biometry and Doppler with ongoing audit. There are multiple methods to calculate EFW and as such it is crucial that all health care professionals should follow the hospital policy. There are many different formulae to calculate EFW with little evidence to suggest which is superior. For measurement purposes it is advised that the ellipse measurement tool is used and calipers are placed in the outer-to-outer position.

Figure 3

Measurements should be recorded in mm or cm and the corresponding centile calculated and included in the report. It is also good practice to assess liquor volume (single deepest vertical pocket), and perform an umbilical artery Doppler. EFW should be reported in grams and plotted on the appropriate centile chart.

(A) Small For Gestational Age

(B) Monitoring

Up to 80% of SGA babies will maintain a normal growth trajectory, normal umbilical artery and fetal Dopplers and won’t develop FGR. Fetus’s diagnosed with SGA will often have serial growth scan monitoring every 14 to 21 days. Biometry assessments at intervals less than 14 days have the highest rate of false positive diagnosis for SGA, in excess of 10%. Whilst 21 days is the optimal interval to assess the trajectory of fetal growth, in practical terms 14 days is commonly used for close monitoring.

(B) Delivery Timing

All decisions should be made in conjunction with the mother, taking into account her wishes. Additional risk factors should always be considered, such as reduced fetal movements or development of pregnancy related hypertension. Appropriate delivery timing in SGA pregnancy is yet to be adequately defined with varying recommendations both nationally and internationally.

Current UK guidance states:

* NHS England (2019): SGA (defined as an EFW between 3rd-10th centile) and no other maternal or fetal concerns, delivery should be offered at 39+0 week’s gestation.
* RCOG (2014): Delivery should be offered at 37 weeks of gestation.

(B) Mode of Delivery

All women diagnosed with an SGA fetus should be offered continuous fetal monitoring in labour. SGA is not a contraindication for induction of labour and vaginal birth.

(A) Fetal Growth Restriction

If FGR is suspected a referral to a fetal medicine specialist should be made. The following is a list of possible, but not exhaustive, indications for specialist referral:

* EFW or AC <3rd centile at 18-20 week mid-trimester scan
* SGA prior to 34 weeks gestation
* Abnormal umbilical artery Doppler prior to 34 weeks gestation
* SGA with any structural anomaly

(B) Investigations

* Placental Insufficiency:
* Uterine artery Doppler assessment to explore placental causes of FGR may be beneficial.
* The placenta can also be assessed for size and appearance, noting any areas of bleed, and also the location of the cord insertion.
* These women are high-risk of developing preeclampsia therefore blood pressure (BP) and proteinuria should be assessed. Additional assessment of renal and hepatic function through blood tests may be indicated as may screening for the placental biomarker ratio of soluble fms-like tyrosine kinase-1 to placental growth factor (sFlt-1/PlFG).
* Chromosomal/Genetic:
* It is advisable to review the fetal anatomy.
* In early onset FGR or in the presence of additional structural anomalies, amniocentesis to allow karyotyping and microarray may be recommended.
* Infection:
* Serological screening for CMV and toxoplasmosis should be considered in FGR with ultrasound features suggestive of infection or unclear aetiology, and amniocentesis offered as appropriate. Syphilis and malaria should be considered as potential causes in at risk patients.

(B) Management

There is no treatment for FGR and therefore close management and timed delivery is the mainstay of care pathways. Many therapies have been explored for the treatment of growth restriction but none have proved effective and some have shown to worsen outcomes.

(C) Extreme Thresholds of Viability

Due to significant advances in neonatal care over the last 10 years the thresholds at which to discuss the chances of fetal viability outside the uterine environment have shifted. In the UK the chance of survival if born at 23 weeks gestation has doubled since 2008 from 20% to 40%. At the extreme end of prematurity, prior to 27 weeks gestation, every extra day in utero confers an additional 2% increased chance of survival. Apart from gestation at birth the other biggest predictor of positive outcome is birth weight. Unfortunately, when the reason for preterm birth is driven by severe FGR these figures are optimistic. FGR is a significant risk factor for poor neonatal outcomes and birth prior to 24+0 weeks gestation holds a risk of death or survival with severe neurological impairment of >90%.

In cases of severe early onset FGR prior to 24+0 weeks, and at times prior to 26+0 weeks, with evidence of developing fetal acidemia supportive discussions should take place with the parents with specialist fetal medicine and neonatal input. The EFW becomes an important factor in these discussions. A general consensus at which to consider delivery is the attainment of an EFW of 500g with some units moving toward 450g as a cut off, but only in conjunction with neonatal colleagues. Realistic discussions around chance of survival and long-term outcomes are needed along with potential maternal morbidity from a complex delivery or a classical uterine incision. All options should be discussed and offered including no intervention to await intrauterine fetal death or termination of pregnancy.

(B) Monitoring

It is important to be aware that assessment of fetal biometry generally shouldn’t take place at intervals less than 14 days. In some cases growth can be assessed with as little as a 10-day interval but is important to remain aware of the greater margin for error.

(C) Early onset FGR

Fetal growth restriction prior to 34 weeks should be an indicator for care under a fetal medicine specialist at a hospital with the appropriate neonatal intensive care facilities. Expert counselling from both fetal medicine and neonatal specialists may be required. The most important predictors of good neonatal outcomes are birthweight and gestation therefore it is these factors that drive management strategies whilst cautiously balancing them against the risk of worsening hypoxia and acidosis and stillbirth if left in utero.

The main stay of fetal wellbeing monitoring in this group of patients are the umbilical artery Doppler, ductus venosus Doppler and computerised CTG. This monitoring strategy has been demonstrated by the Trial of Randomised Umbilical and Fetal Flow in Europe (TRUFFLE) study to produce better long-term fetal outcomes.

* Umbilical Artery

The umbilical artery (UA) reflects the initial fetal response to placental insufficiency. Firstly, the increased resistance in the placental vascular bed and increased fetal afterload manifests as a raised pulsatility index (PI) above the 95th centile. As the fetal reserve declines changes within the end diastolic flow are observed, from absent to reversed flow. The duration it takes for the UA Doppler to deteriorate from an elevated PI to reversed EDF can be highly variable but it is often several weeks.

* Ductus Venosus

The ductus venosus (DV) joins the umbilical vein to the inferior vena cava, which empties into the right atrium. Therefore reflecting fetal cardiac function, namely the right atrium volume and pressure changes. During the progression from hypoxia to acidaemia the DV vessel dilates in an attempt to direct more oxygenated blood into the heart. It is likely that from a combination of this and rising atrial pressure due to increasing afterload and possible myocyte dysfunction from acideamia the altered patterns in the DV A-wave are observed. Firstly the A-wave, which corresponds to atrial contraction, becomes absent and then reversed.

Figure 4

* Middle Cerebral Artery

As part of the vascular adaptation seen in the growth restricted fetus in response to hypoxia, the middle cerebral artery (MCA) vasodilates. This is to encourage more blood flow to the cerebral arteries as blood is being preferentially diverted to cardiac tissue and adrenal glands. This causes a decrease in the MCA PI, less than the 5th centile, and this observation is referred to as ‘brain-sparing’. The MCA is often assessed as part of a comprehensive assessment of fetal wellbeing in this group of patients. Despite this the MCA should not be used to time delivery, as it has not been shown to correlate with neonatal or later neurodevelopmental outcomes.

* Computerised CTG

Computerised CTG (cCTG) is a crucial component of monitoring FGR fetuses. A normal short-term variability (STV) reflects a normal autonomic nervous system and can be used to exclude severe hypoxia. It is important to stress that this cannot be determined by visual inspection and therefore only cCTG should be employed for FGR monitoring. The safety net criteria for delivery based on cCTG thresholds are:

* STV <2.6ms 26+0 to 28+6 weeks
* STV <3.0ms from 29 weeks onwards
* Recurrent and unprovoked decelerations from 26+0 weeks onwards

Decisions regarding monitoring frequency are based on the degree of fetal smallness and fetal Dopplers and any additional risk factors such as preeclampsia or reduced fetal movements. A general approach to monitoring frequency is outlined below:

* Raised UA PI: Weekly Dopplers, twice weekly cCTG
* Absent EDF: Twice to three times weekly Dopplers, three to four times weekly cCTG
* Reversed EDF: Daily Dopplers and cCTG
* Absent or reversed DV A-wave: Deliver within 72 hours

(C) Late onset FGR

The umbilical artery Doppler is also used for fetal monitoring in FGR identified after 32 weeks gestation. Despite this it is important to recognise that absent or reversed EDF does not usually develop in late onset FGR. The pathophysiology of this phenotype is less well understood and defined. Again, there is thought to be less pronounced alterations in diffusion of oxygen and nutrients across the placenta but as these fetuses are older with a higher metabolic rate they are less able to tolerating these more subtle changes. Despite the lack of change within the umbilical Doppler there is evidence to show that a low MCA PI in this group could predict poorer outcomes such as stillbirth and worse neurodevelopmental outcomes. The MCA Doppler can therefore be considered for fetal monitoring from 34 weeks gestational age. The RCOG guidelines advise delivery no later that 37 weeks in the presence of an abnormal MCA Doppler but this remains controversial. There is no consensus on exactly how this parameter should be used to time delivery at present. Further Doppler’s are not routinely assessed in late onset FGR, as there is inconclusive evidence to guide management.

Every patient requires individualised care based on their clinical assessment but the following generalised guidelines are advised:

* Normal umbilical artery Doppler: Repeat ultrasound monitoring in 14 days
* Elevated umbilical artery pulsatility index (PI): Once to Twice weekly ultrasound monitoring
* Absent end-diastolic flow in the umbilical artery Doppler: Delivery is to be considered from 30 week and recommended by 32 weeks

(B) Timing of Delivery

Maternal condition remains paramount therefore it is important to remain astute to clinical factors such as severe preeclampsia or placental abruption that would necessitate earlier delivery.

(C) Early FGR

Since the publication of the RCOG guideline the TRUFFLE study has brought clarity to the timing of delivery for early onset FGR. This RCT allocated women with FGR prior to 32 weeks to 1 of 3 monitoring groups: computerised CTG Vs early DV changes Vs absent or reversed DV A-wave. There were clear safety net criteria that allowed clinicians to deliver sooner if necessary. Those babies monitored under the absent or reversed DV A-wave arm, as the method for timing of delivery, had better long-term neurodevelopmental outcomes. This is the basis behind the current recommendations, which have been adopted across Europe, for monitoring early onset FGR.

1. Delivery Criteria

* Between 24+0 to 25+6 each patient requires an individual care plan.
* Absent or reversed DV A-wave from 26+0 - 29+6 weeks.
* Reversed or absent UA EDF consider delivery from 30+0 and recommended by 32 weeks.

(C) Late FGR

* Absent or reversed UA EDF should indicate delivery at any gestation.
* Raised umbilical artery PI advise birth no later than 37weeks.
* An EFW <3rd centile, and no other maternal or fetal concerns, delivery should be offered at 37+0 weeks gestation.

(B) Mode of Delivery

Caesarean birth is advised in the presence of absent or reversed EDF in the UA and would therefore be the case for all early onset FGR cases. These foetuses are unlikely to withstand the stresses of uterine contractions due to a pre-existing lower pH and less reserve. Caesarean birth would also be advised in the group of patients requiring expedited birth due to cCTG ‘safety net criteria’ as this already suggests the presence of fetal acidosis.

Women being advised early delivery for late onset FGR with a raised UA PI should be assessed on a case-by-case basis considering parity, gestation, cervical assessment and the woman’s wishes.

1. Practice points

* SGA fetuses include 2/3rd small fetuses and 1/3rd with fetal growth restriction that are at increased risk of stillbirth and poor neonatal outcomes
* The screening pathway in the UK includes assessment of risk factors, serial SFH measurements (low risk women) or serial ultrasound scans (high risk women) with the aim of identifying at risk fetuses.
* Fetal growth charts customised for each woman are recommended by the RCOG. Alternatives include population charts and standard charts.
* There is currently no effective treatment for FGR and the mainstay management hinges on close fetal surveillance and careful timing of delivery to optimise neonatal outcome.

(A) Further Reading

1. Royal College of Obstetricians and Gynaecologists (2013). RCOG Green-Top Guideline 31: The Investigation and Management of the Small for Gestational Age Fetus. London: RCOG.

2. NHS England (2019). Saving Babies’ Lives Care Bundle Version 2. London: NHS England.

3. Lees CC, Stampalija T, Baschat AA, da Silva Costa F, Ferrazzi E, Figueras F, Hecher K, Kingdom J, Poon LC, Salomon LJ, Unterscheider J. ISUOG Practice Guidelines: diagnosis and management of small-for-gestational-age fetus and fetal growth restriction. Ultrasound Obstet Gynecol 2020; 56: 298–312.

Table 1

Consensus definition of fetal growth restriction

|  |  |
| --- | --- |
| (A)Early FGR  < 32 weeks gestational age | (A)Late FGR  ≥ 32 weeks gestational age |
| AC or EFW <3rd centile  OR  Absent UA EDF | AC or EFW <3rd centile |
| OR | OR  2 OUT OF THE FOLLOWING 3 |
| AC or EFW <10th centile  WITH EITHER  Uterine Artery PI >95th centile  Umbilical Artery PI >95th centile | 1. AC or EFW <10th centile 2. AC or EFW crossing >2 quartiles 3. CRP <5th centile or UA-PI >95th centile |

Table 2

Risk factors for assessing risk of having a pregnancy affected by a small for gestational age fetus

|  |  |
| --- | --- |
| (A)Moderate Risk Factors | (A)High Risk Factors |
| (B)Booking   * Maternal age 40 or over   (C)Previous Pregnancy   * Previous SGA * Previous AGA stillbirth   (C)Lifestyle   * Smoking * Drug use | (B)Booking  (C)Previous Pregnancy   * Previous FGR * Previous SGA stillbirth * Previous hypertensive disease of pregnancy   (C)Co-morbidities   * Essential hypertension * Chronic kidney disease * Systemic lupus erythematosus * Antiphospholipid syndrome * Cyanotic congenital heart disease |
| (B)Women Unsuitable for SFH Measurement   * BMI ≥ 35 * Large or multiple fibroids | (B)During Pregnancy   * Low PAPP-A (<5th centile) * Echogenic bowel * Significant bleeding * EFW <10th centile at anomaly scan * Pregnancy related hypertension |

Figure 1

Causes of an estimated or actual fetal weight less than the 10th centile

Figure 2

Screening pathway for women at risk of a small for gestational age fetus

Figure 3

The anatomical planes and ultrasound views required to perform a growth scan: (a) Head Circumference (HC), (b) Abdominal Circumference (AC), (c) Femur Length (FL), (d) Deepest Vertical Pool (DVP) of amniotic fluid.

Figure 4

Evolution of deteriorating fetal Dopplers in early fetal growth restriction