

GUIDELINES FOR INTRAUTERINE GROWTH RESTRICTION AND CHRONIC FETAL HYPOXAEMIA

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REZUMAT

Restricția de creștere intrauterină (RCIU) este o problemă majoră în medicina perinatală, prevalența fiind în jur de 8%. Acest grup este afectat de un procent crescut de nașteri cu evoluție nefavorabilă ca urmare a deceselor neonatale și morbidității precoce și târzii. A fost menționat și faptul că anumite boli (cardiovasculare și metabolice) prezente la adult pot fi consecința unor lipsuri din perioada de viață intrauterină. Etiologia este multifactorială, dar cauza cea mai comună și mai importantă pentru evoluția nefavorabilă este hipoxia fetală cronică. Așadar, pentru îmbunătățirea ratei nașterilor prin managementul HFC, recunoașterea oportună a RCIU este crucială. În prezentul studiu sunt discutate criteriile de definire și recunoaștere a RCIU; sunt prezentate caracteristicile managementului HFC, utilizând metode moderne de semiologie.

Cuvinte cheie: RCIU, HFC, Doppler, CTG

ABSTRACT

Intrauterine growth restriction (IUGR) is a major problem in perinatal medicine. Its prevalence in a general population is about 8%. The rate of adverse outcome is significantly increased (stillbirths, neonatal mortality and morbidity, early and late as well) and it has been postulated that also some diseases (cardiovascular and metabolic) present in adult life can be the consequence of in utero deprivation. The etiology is multifactorial but the most important and frequent cause of the poor outcome is chronic fetal hypoxaemia (CFH). Therefore, as it has been shown that the outcome can be improved by proper management of CFH, a timely recognition of IUGR is crucial. The criteria for Definition and Recognition of IUGR are discussed. The characteristics of the management of CFH, by using modern instrumental semiology, are presented.

Key Words: IUGR, CFH, Doppler, CTG

INTRODUCTION

Fetal growth restriction (IUGR) is associated with increased perinatal mortality and morbidity, possibly extending also in adult life, as compared to fetuses and newborns presenting characteristics of normal growth. Many years ago it has been observed that newborns having a birthweight (BW) below the tenth percentile for gestational age, defined as Small for Gestational Age (SGA) have a poor perinatal outcome. Moreover, the prevalence of the unfavourable outcome is inversely proportional to the BW percentile.

The reduced BW has been considered the consequence of growth restriction during fetal life and therefore SGA and IUGR became synonymous. After the introduction in clinical practice of the ultrasound (US) biometry and the possibility to

monitor fetal growth before birth the scenario started to change.

Moreover the technical improvement, allowing the recognition of both cause and consequence in many cases of IUGR, has offered the possibility to improve management and outcome. It became also clear that SGA and IUGR are not synonymous and that both are not per se a pathological condition as they only indicate an increased risk of adverse perinatal outcome consequence of a disease: maternal, fetal or placental.

The prevalence of IUGR is about 8% of general population. In about 35-40% of the cases IUGR is the consequence of an abnormal condition. It has been shown that 52% of stillbirths is associated with IUGR and 10% of perinatal mortality is the consequence of undetected IUGR.^{1,2}

Looking at the prevalence of SGA stillborn fetuses it has been observed that between 31 and 33 weeks 72% of unexplained fetal deaths were associated with a weight below the 10th percentile. Also in term stillbirths, SGA fetuses are observed with increased frequency, even if less pronounced than in preterm cases.³

The aim of this paper is to focus mainly on some still controversial aspects, namely: definition, recognition, screening and management.

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Received for publication: Aug. 24, 2008. Revised: Jun. 22, 2009.

DEFINITION

This aspect is one of the most critical when dealing with IUGR because there is a surprising lack of uniformity in the majority of the studies. As already said for a long time IUGR has been a postnatal diagnosis based on the BW or on some anthropometrics characteristics of the newborn. Until the introduction of the ultrasonic fetal biometry no other precise methods were available for assessing fetal size and growth before birth. This new possibility has offered a better insight into the fetal growth process. As a consequence from the end of the 80 many authors have indicated the necessity to rethink IUGR definition particularly distinguishing IUGR from SGA. In 1989 Altman and Hytten have clearly pointed out the necessity to distinguish between “size” and “growth” and the urgent need to establish true measures of fetal growth.⁴ Ott proposed to identify IUGR by comparing a projected ideal weight at birth and the actual BW.⁵ It was a progress toward the right direction, but it was still a post-natal assessment and therefore of little use in obstetrical clinical management. In the year 1999 Soothill et al have identified in the literature 4 different definitions for SGA fetuses stressing the need of better and uniform definition.⁶ Also very recently the Royal College of Obstetricians and Gynecologists acknowledges that there are several thresholds of the estimated fetal weight for classifying a fetus as growth restricted.⁷ They are 7: <25th, 15th, 10th, 5th, 3rd, 2.5th percentile or 2.0 standard deviations below the mean. In the year 2000 a more satisfactory definition of IUGR has been suggested by the ACOG that is: “IUGR is a fetus that fails to reach his potential growth”.⁸ Moreover ACOG has proposed that the term IUGR should be used only in regard to the fetus while SGA should be used only in regard to the newborn. Shortly after the year 2001, a Consensus Conference of Pediatricians has again stressed that SGA and IUGR are not synonymous. IUGR suggests a diminished growth velocity of the fetus documented by at least 2 intrauterine growth assessments.⁹

This can be considered an important step because in this way the function (growth) became the object of interest instead of the result (weight or size). Unfortunately in many recent studies this concept is not applied and IUGR is defined on the basis of estimated fetal weight (EFW) or Abdominal Circumference (AC) below a predefined threshold and also still on the BW.

At the best in some studies IUGR is defined on the basis of “smallness” associated with abnormal Doppler findings in umbilical arteries as it has been

suggested by Soothill and Ott.^{6,10} There are many possible reasons for this lack of uniformity that induces a sort of anarchy. The principal one probably depends on the difficulty in overcoming and forgetting the old criterium of weight that has been used for so many years. Another one is possibly represented by the fact that assessing postnatally the BW is easy to perform, unexpensive and always available for retrospective studies. Moreover in order to detect more exactly and timely the failure to reach the inherent potential growth more complicated procedures are needed. This aspect will be discussed in the chapter of IUGR recognition.

In conclusion it is advisable that a uniform and generally accepted definition of IUGR based on the growth characteristics and not on the weight or size should be used. At the moment the definition suggested by ACOG seems to be the more appropriate.

The availability of a clear definition, universally accepted, is not solely a problem of semantic. In fact there is a cascade of consequences. The methods for the recognition, screening and diagnosis of IUGR are strongly dependent on the concept and definition of IUGR.

RECOGNITION AND DIAGNOSIS.

As already said IUGR or SGA are not per se a disease or a diagnosis. They are just symptoms of increased risk of the presence of a pathological condition that have adversely affected the inherent potential growth of the fetus.

As for any other clinical condition the first step of the management of IUGR is its recognition and to make a proper diagnosis whenever possible before birth.

As a consequence in the case of IUGR this is a two step procedure:

1. Recognition of the growth restriction.
2. Identification or exclusion of possible pathological conditions and identification of the primary etiology.

RECOGNITION

First of all it should be clear that the target of IUGR recognition is different from the prediction of BW or SGA infant. Therefore the characteristics of the methodology that should be applied is strongly dependent on the definition of IUGR that is considered.

Accepting the definition of ACOG the IUGR recognition is in principle very simple. Practically any observed measure of fetal size at a given GA has to be compared to that expected for this fetus after

projection of his normal potential growth.

In practice this process is not always so simple. Some criteria must be respected:

To know as exactly as possible the GA whenever possible by US biometry in early pregnancy.

To compare the obtained measures by using growth charts that refer to the considered population taking also into account other factors influencing fetal growth by using customized growth charts as proposed by Gardosi.¹¹

When IUGR is suspected a successive measurement should be carried out at sufficient time interval (not less than 2 weeks apart).^{12,13} Growth rate tables taking into consideration distance between measurements (4, 6, 8 and >10 weeks) have been produced.¹⁴

In practice every fetus should be his own control.¹⁵

It is necessary to evaluate what are the best methods that can be used for that purpose.

1. GA assessment

Gestational age assessment based on the last menstrual period is unreliable also in case of eumenorrhic women. Ultrasound biometry performed in the 1st trimester by measuring crown rump length (CRL) or before 20 weeks GA by measuring Biparietal Diameter (BPD) is considered the most accurate method for assessing GA.^{16,17}

In case such an assessment is not available it is possible to overcome the problem by measuring the transcerebellar diameter (TCD). It has been shown that TCD measurement predicts GA with a 3 days of error in 97.5 % of the case in the 2nd trimester and in 93.3 % of the case in the 3rd also in presence of abnormal growth.¹⁸

2. Assessment of fetal size and growth

The most commonly used methods for estimating the fetal size are clinical palpation, symphysis-fundal height (FH) measurement and ultrasonic fetal biometry. The last one must be considered the most accurate. Ultrasonic fetal biometry correctly performed is highly reliable and intra- and inter-observer variability is acceptable.¹⁹ The most used ultrasonic biometric parameters in late 2nd and 3rd trimester are biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC) and femur length (FL). BPD, AC and FL are also used for calculating the estimated fetal weight (EFW).

For estimating FW several formulas have been proposed but the systematic error is comprised between 7 and 10 % of the actual weight in defect or in excess as well.^{20,21} It has been shown that including more parameters in the formulas the error is increased. The inaccuracy of EFW has been underlined and it has been suggested to use this parameter with care.^{22,23}

AC is very well correlated with the fetal weight and therefore it could be used alone for the assessment of fetal size.²⁴

3. Evaluation of growth

Given a known GA the biometric parameter that has been observed must be compared to that expected for the GA. In order to define as growth restricted a fetus two conditions must be respected:

1. The comparison should be made with growth charts built on the studied population.
2. A criterium must be chosen for defining as indicator of growth restriction a measured parameter.

Growth charts

The importance of the choice of reference charts for the assessment of fetal biometry has been underlined.²⁵ Many growth charts for the ultrasound biometric parameters are available. Some of them have been built on homogeneous fetal population and therefore should be preferentially used when available.²⁶⁻³⁰ The use of customized growth charts, taking into consideration factors normally influencing the fetal growth, reduces the number of the false positive.^{11,31,32} To compare the EFW with charts based on BW cannot be considered correct especially in case of low GA fetuses.

Biometric parameters

The choice of the biometric parameter to be used can be different if the purpose is investigation of fetal antropometrics or use in clinical practice. In the last case the choice should be made on the basis of practical criteria. The biometric parameter must be easy to evaluate, reproducible, to have a reduced systematic error, obtainable in a relatively short time and must be representative of the fetal growth. At the moment these criteria are best respected by AC.

Criteria of growth restriction

The criteria used to suspect growth restriction are many as they are reflecting the different definitions that are considered. In the majority of the studies when the biometric parameter (AC or EFW) is inferior to the selected threshold IUGR is suspected. The 10th percentile is commonly used.

The lower the threshold the higher the specificity and the lower the sensitivity. In fact all the fetuses showing by serial biometry growth restriction but presenting an EFW superior to the selected threshold will be missed. This is a critical point. In fact in this way the target is to identify SGA fetuses but not growth restricted fetuses. It is easy to believe that this concept is again a heritage of the old one based on weight (the result) and not on function (the growth).

It has been shown that newborns with appropriate

BW can present signs of growth restriction.³³ Moreover it has been also documented that stillborn rate is excessive also in fetuses that have a weight comprised between the 10th and the 15th percentile.³⁴ Also newborns with a BW over the 50th percentile but with signs of reduced growth have CTG characteristics similar to SGA.³⁵

It must also be remembered that the systematic error of the EFW is done to 10 % compared to the actual weight. As a consequence by choosing as a threshold any percentile of EFW for defining IUGR the number of both false positive and negative is likely to be 10 %.

The evaluation of growth velocity after serial measurement can offer a better insight into the characteristics of the growth process and is correlated with the outcome.³⁶

Practically it must be stressed that IUGR recognition is largely different from BW or SGA prediction. What must be assessed is the function (growth) and not the result (size or weight).

To make it possible it is necessary to perform:

- Exact GA dating.
- A successive evaluation for projecting the expected individual curve of growth.
- Successive examinations for detection of any significant deviation from the expected value.

A limited attention should be paid to the weight (EFW or BW) because taking into consideration both growth and weight we can observe fetuses or newborns that are: 1. SGA but not IUGR; 2. SGA -that are also IUGR and 3. SGA that are IUGR.

The restriction of growth is more important for determining the outcome than the weight. Uniform criteria for defining a fetus as growth restricted on the basis of biometric parameters are not available. As already said the RCOG offers 7 different criteria.⁷ A survey carried out in Sweden in 42 Departments has shown that 3 different criteria were used.³⁷ They were namely 1.5, 2 and 2.5 SD below the mean.

By applying any of these criteria the IUGR fetus presenting at serial biometry a parameter (AC or EFW) that has moved from the 60th percentile to the 30th along time will remained unrecognized.

It is very clear that what is needed is the identification, by prospective studies, of the level of the **restriction of growth** from the expected for this fetus, that is associated with increased perinatal mortality and morbidity therefore indicating the application of second level tests.

At the moment it seems advisable to suspect IUGR when the AC deviate 10 % or more from the individual projected curve of growth.

DIAGNOSIS

As already said this is a two step procedure. After recognition of IUGR it is necessary to distinguish between fetuses that are growth restricted but otherwise healthy and those that are consequence of an abnormal condition: maternal, fetal or placental.

In practice this means to perform an exhaustive research of the possible etiology identifying or excluding whenever possible the condition that have adversely affected the inherent growth capacity.

SCREENING

The aim of a screening procedure is to identify in a population believed to be free of a disease or condition the subgroup that have the condition or is carrying an increase risk to develop it. A screening procedure can be applied to a general population or to a population selected on the basis of known risk factors. In the case of IUGR the task is the timely detection of this risk condition. In order to be advisable any screening must respect some criteria. The condition must be prevalent and severe enough to be a problem of public health. A treatment must be available and if it is detected prior to the usual time of diagnosis the outcome should be improved. IUGR respects these condition.

Also the test that has to be used must respect some criteria. Must be sensible and specific enough to avoid or reduce false positive and negative. Must be easy to perform and not provoke adverse effect or discomfort to the patient. US biometry respects also these criteria.

For the screening of IUGR clinical palpation and FH measurement have been proposed. The advantage is that they are easy to perform and unexpensive. On the contrary the sensibility and specificity are not considered sufficient to be used as screening techniques. Ultrasonic biometry should be considered at the moment the method of choice.

In the year 2000 Bricker and Neilson have concluded that routine ultrasound after 24 weeks for IUGR recognition does not confer benefit to mother or fetus.³⁸ This conclusion was based on the evaluation of 7 randomized studies. Examining in details these studies it is evident that many were very old and that in the majority of the cases the target was not IUGR detection but SGA newborns prediction. Moreover no uniform protocol for the management was available. It is not surprising that the conclusions were negative.

More recent studies have shown that prenatal recognition of SGA improves their outcome.³⁹ A RCT considering scans at 30-32 and 36-37 weeks

has also shown a reduced risk for IUGR cases.⁴⁰ It is advisable that screening for IUGR should be a general one as only 50 % of IUGR fetuses are presenting risk conditions.⁴¹ In many European Countries 4 scans are routinely offered in pregnancy and as consequence a screening for IUGR is feasible.

Therefore we can only say that prospective, well designed RCT are needed particularly considering IUGR and not SGA prevision as end points. Moreover, if the target is to assess if a timely detection of IUGR improves the clinical outcome common definition of IUGR and management protocols must be considered.

MANAGEMENT

The characteristics of the obstetrical management is strongly dependent on the primary etiology of IUGR. In case of maternal clinical conditions like preeclampsia it is mainly dependent on the characteristics of the maternal disease.

When the etiology is fetal (infections, chromosomal abnormalities and malformations) no management can significantly improve the outcome and sometime it can be considered as a contraindication for aggressive management.

On the contrary when IUGR is the consequence of placental obliterative vasculopathy, often described as placental insufficiency, inducing CFH, present in 30-35 % of the cases the outcome can be improved and the management should be based on its careful monitoring.⁴²

When affected by CFH the fetus undergoes changes of many vital functions. The close monitoring of these changes is the basis of the management. As the only therapy for CFH is the delivery it is crucial to choose the best timing.

The most commonly used methods are represented by:

1. Doppler studies
2. Cardiotocography
3. Amniotic fluid amount evaluation
4. Fetal biophysical profile

1. Doppler changes.

The Doppler velocity waveform in arteries is mainly influenced by the characteristics of the diastolic phase and reflects the peripheral resistance to blood flow. The Pulsatility index (PI) assessment is commonly used. PI values increase as the peripheral resistance increases. In very severe conditions absence of flow in diastole (AEDF) or reverse flow (RF) can be observed. The last patterns are called ARED flow and the fetal compromise is almost always present.

Perinatal mortality and morbidity early or late as well, are very high but with a significant difference between cases presenting AEDF or RF.⁴³

Doppler changes observable at the level of the UA indicate the characteristics of the placental vasculature and therefore are expression of the reduced blood supply to the fetus. The PI is proportional to the obliteration of the placental vascular bed and the DVWF becomes to be altered when the 60 % of the vascular bed is obliterated.^{44,45} Therefore is a very specific sign of reduced blood supply to the fetus inducing CFH. Its study is fundamental for the recognition of the compromised IUGR fetus. Evidence has been given that its clinical use improves the perinatal outcome.⁴⁶

Haemodynamic changes are also observable in the fetus. They first represent the mechanism of "adaptation" by blood flow redistribution. Their study offers a better insight into the fetal condition but there is no strong evidence that by using in clinical practice these information the perinatal outcome is improved.

The interest of many studies has been also directed to the haemodynamic characteristics of the venous system (umbilical vein, vena cava inferior and others). Particularly the ductus venosus has been object of the interest. Severe changes at this level are considered the best predictor of adverse outcome together with GA.⁴⁷⁻⁵¹ Its clinical use for timing of the delivery is still argument of debate.^{52,53} One RCT study (TRUFFLE) is ongoing in order to assess if Ductus Venosus Doppler investigation can be used in clinical practice for choosing the timing of the delivery.

2. Cardiotocography (CTG)

CTG is the most used method for assessing fetal heart rate before and in labor as well. Before labor CTG can be performed without stimuli (Non Stress Test-NST) or inducing contractions, usually by oxytocin perfusion (Contraction Stress Test-CST). The criteria for examining and evaluating a CTG have been described.⁵⁴ The performance of NST is matter of discussion as great variability intra- and interobserver has been observed. In order to overcome this limitation computer assisted CTG has been introduced in clinical practice. In this way it is possible to analyze on line the Short term FHR variability (STV) that is a very sensible and specific predictor of fetal hypoxaemia and acidaemia.⁵⁵ By observing the absolute value of the variability and particularly its trend over time it is possible to detect also subtle sign of fetal deterioration therefore optimizing the timing of the delivery.⁴⁸ STV assessment, when substituted for the traditional NST reduces the rate of equivocal biophysical scoring (BPS) from 16 % to 7.1 %.⁵¹

3. Amniotic Fluid Evaluation

In case of hypoxic IUGR the renal perfusion can be reduced and as a consequence the fetal urine production and amniotic fluid amount are also reduced.

Amniotic fluid amount is commonly assessed by using the amniotic fluid index (AFI) or measuring the deepest vertical pocket.^{56,57} Both methods are poor predictors of adverse outcome in high-risk pregnancies.⁵⁸

4. Fetal Biophysical Profile (FBP)

The FBP is a scoring System obtained observing 5 parameters: NST, fetal breathing movements, fetal movements, fetal tone and amniotic fluid volume.⁵⁹ There is no evidence of better performance of FBP as compared to other form of fetal assessment in high-risk pregnancies.⁶⁰

CONCLUSION

In conclusion, the clinical management of IUGR should be based on:

1. Timely recognition by screening;
2. Identification of the primary etiology (maternal, fetal, placental);
3. Assessment of fetal condition (Presence or absence of CFH);
4. Monitoring of the fetal wellbeing and possible deterioration;
5. Timing of the delivery when indicated;
6. Choice of the way of the delivery;
7. Choice of the place of the delivery.

Points 1, 2 and 3 have been already discussed.

4. Monitoring

There is no evidence that one monitoring method is superior to another. The best possibility is to look at their trends over time. A comprehensive study of these trends has been produced.⁶¹ The study was prospective longitudinal on 110 singleton pregnancies after 24 weeks gestation. The fetuses have been defined as IUGR on the basis of an AC < 5th percentile. The probabilities of abnormal findings before delivery has been studied for: AFI, UA Doppler, Middle cerebral Doppler, Short term variability on computerized CTG, fetal aorta Doppler, ductus venosus and inferior vena cava Doppler. Differences have been found between cases delivered at or before 32 weeks and those delivered after 32 weeks. Interesting to note that the timing of the delivery was mainly based on the data offered by the computerized CTG when the short term variability was inferior to 3 millisecond.

5. Timing of the delivery

The timing of the delivery, when indicated, is a critical aspect: not too early, not too late. The GA is the most important factor influencing the outcome therefore the choice of the management of IUGR

fetuses is different according to the GA. As clear guidelines supported by strong evidence are not available protocols of management should be based on the available knowledge and clinical judgement. As Doppler study on UA is in condition to identify the IUGR fetuses that are consequence of placental insufficiency it should be considered as the first step, after IUGR suspicion, for optimizing controls and management.

I. IUGR with normal UA Doppler Waveform and normal fetal wellbeing tests (Fetal Doppler, STV): Serial biometry without aggressive management.

II. IUGR with UA PI >2 SD Flow in Diastole present and fetal wellbeing test normal (very uncommon condition).

A. More than 34 weeks. UA Doppler and fetal wellbeing tests twice weekly. Delivery according to the tests results.

B. Less than 34 weeks. Doppler and fetal tests twice a week. Consider corticosteroids administration. Delivery according to the tests results.

III. IUGR with UA > 2 SD Flow in Diastole present and abnormal fetal tests (Blood flow redistribution, reduced STV).

A. More than 34 weeks. Daily UA Doppler and fetal tests. Consider delivery.

B. Less than 34 weeks. Corticosteroids administration. Daily UA Doppler and fetal tests. Consider delivery. In all these conditions a trial of vaginal delivery can be attempted under strict monitoring.

IV. IUGR with UA AEDF. Fetal wellbeing test are usually abnormal.

A. More than 34 weeks. Consider delivery.

B. Less than 34 weeks. Corticosteroids administration and consider delivery.

V. IUGR with UA RF in diastole. Fetal wellbeing tests are always abnormal.

A. After 34 weeks. Exhaustive counselling on mortality and morbidity (early and late as well). Active or expectant management according to the choice of the family.

B. Before 34 weeks. Corticosteroids administration. Other considerations as for point A. Probably the only condition when Doppler patterns are indication to deliver is the case of ARED flow. As already said the management should be different according to the pattern that is observed.

In case of AEDF it is not necessary an immediate active management. Some days, under strict control, of delay can offer the possibility to enhance fetal lung maturity by corticosteroid administration, when needed. The GRIT studies have shown no differences

between early (0.9 days) and delayed (4.9 days) delivery in short term outcomes⁶² and long term as well.⁶³ On the contrary the observation of RF predicts intrauterine death in few days and a very high neonatal mortality and an excessive prevalence of severe handicaps among survivors. Therefore the problem is not only clinical but also ethical necessitating an exhaustive counselling with the family in order to make a choice between active management or abstention.

Summarizing the management can be different according to the gestational age. After 34 weeks and with a guarantee of fetal lung maturation, if the fetal condition is non reassuring the delivery is advisable. Before 33-34 weeks the choice of the delivery is a compromise between the risks of in utero life in adverse condition and the risk of large prematurity. Antenatal corticosteroids administration has a positive effect both short and long term.⁶⁴

The counselling must be informative and not directive respecting the principle of autonomy of the mother also if sometime can be in contrast with the principle of beneficency for the fetus.

6. Choice of the delivery way

IUGR per se does not indicate caesarean section. The choice is dependent on the level of the fetal compromise. The more pronounced the hypoxaemia and acidaemia the less likely vaginal delivery will be safe. Also in case of IUGR with abnormal UÅ Doppler the vaginal delivery, under close monitoring, can be attempted with a success rate of 24 % (42) or 40 %.⁶⁵

7. Place of delivery

Whenever possible the birth of IUGR should take place in a center where the best neonatological assistance can be provided.

SUMMARY

Perinatal mortality and morbidity are significantly increased in IUGR fetuses and in SGA infants. The two terms cannot be considered as synonymous. IUGR should be defined as "a fetus that fails to reach his potential growth" while SGA newborns are those that present a BW inferior to a predefined threshold, usually the 10th percentile. It must be stressed that IUGR or SGA are not per se an abnormal condition. Prenatal recognition of IUGR is the first step to a clinical management.

For that purpose a uniform definition and uniform criteria for recognition are necessary. As the etiology of IUGR is multifactorial (maternal, placental or fetal) and influencing management and outcome a careful evaluation of any single case must be carried

out. In case of placental factors by using 2nd level tests (Doppler, CTG, FBP) it is possible to identify the affected fetuses. The most frequent and important complication is CFH. By monitoring the changes of fetal vital functions it is possible to improve both management and outcome. The timing of the delivery is a crucial and often puzzling problem. Especially in case of prematurity and particular patterns of Doppler (ARED flow) it is necessary to make a compromise between the risk of be retained in utero in adverse conditions and the risks of the large prematurity. Anyway the birth of these fragile babies should take place in Centers where an appropriate neonatologic assistance can be provided.

Some aspects are still controversial. In particular Definition, Criteria for recognition and Screening are aspects of not uniform approach. It is advisable that a consensus should be reached.

Recently the World Association of Perinatal Medicine (WAPM) has produced Guidelines for IUGR offering also recommendations that are here presented.⁶⁶

1. The term IUGR and SGA are not synonymous. IUGR is used for the fetus and SGA is used primarily for the newborn
2. IUGR should be defined on the basis of serial measurement showing restricted growth.
3. AC measurement is easy to perform and can be used for growth assessment.
4. Customized, population specific growth charts, should be used when possible.
5. The timely recognition of IUGR improves both management and outcome. Screening for IUGR should be considered.
6. When IUGR is suspected, the etiology should be explored.
7. When the etiology is thought to be placental, Doppler study of the umbilical artery allows the identification or exclusion of significant chronic fetal hypoxaemia. Close monitoring of Doppler blood flow changes should guide the clinical management.
8. There is no evidence that one type of monitoring is superior to another. Serial fetal assessment is optimal to identify the best time of delivery.
9. Careful monitoring of the IUGR fetus in labour is crucial as a rapid deterioration is possible with uterine contractions.
10. Detailed counselling with the family that includes the obstetrician and the neonatologist is recommended.
11. Delivery of IUGR should take place where an appropriate neonatal care is available. In utero

transport should be preferred.

12. After delivery of a neonate with IUGR, early neuroimaging is recommended.
13. There is no effective management for the prevention or in utero treatment of IUGR. In case of CFH the only effective therapy is delivery.

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