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Evaluation of Fetal Abdominal Circumference versus Estimated Fetal Weight in the Recognition of Late Onset Fetal Growth Pattern Restriction

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Abstract:

Objective:

To display a an assessment and comparative analysis between expected fetal weight (EFW) and abdominal circumference (AC) in the capacity to reveal and expect of late onset fetal growth restrictive pattern

Patients and Methods:

A group of recruited random singleton gestations sonographically examined and evaluated at 32 and 37weeks. Fetal growth evaluation by measuring the abdominal circumference and expected fetal weight, and both measurements obtained. Put in comparison for their predictive capabilities for late onset fetal growth restriction. A Restrictive growth pattern was described as growth parameter of less than 10th centile.

Results:

A total of 938 gestations were recruited in the research study falling growth curve pattern between 32and 37weeks was correlated with late onset Fetal growth Restriction, but the analytical capability of both Abdominal Circumference and expected fetal weight was of weak capacity in comparison, with recognition rate of around 28% at a 10% rate of false positives for late onset Fetal Growth Restriction..

Conclusion:

Analysis and evaluation of fetal growth pattern all through the third trimester of gestation have a weak capacity for prediction of late onset fetal growth restriction, with no statistically significant differences observed when comparing abdominal circumference and expected fetal weight.

Keywords: Fetal growth Restriction, Abdominal Circumference, gestational age, sonography, intrapartum fetal distress.

Introduction:

Fetal growth restrictive pattern is described as a fetal weight observed to be under the 10th centile for the relevant gestational age as analysed and evaluated by sonography additionally in a more descriptive manner it is considered and known to be failure to Reach the full growth possible capacity , usually mostly due to placental disease that causes placental physiological dysfunction

With reduced perfusion parameters [1]. Fetal growth restriction uncovering is tricky and the recognition performed in classic and routine antenatal care is commonly low [2], even though prenatal discovery and proper clinical diagnosis decreases the hazardous fetal outcomes [2-4] on the other hand, updated research obtained evidence implies and proves that the clinical diagnosis of fetal growth restriction must not rely or depend only on the umbilical artery perfusion parameters obtained by doppler performance. [5, 6].

Since the bulk of gestations with delayed onset of the fetal growth restrictive disease pattern are usually uncovered after 32–34 gestational weeks have normal parameters and indices in the umbilical artery doppler , even as evidence of placental perfusion insufficiency exists [10-15]. For that reason, incorporated third-trimester parameters, and correlation of the

etiological factors correlated to hazardous perinatal outcome e.g. cerebroplacental ratio (CPR) it is an obstetric sonographic parameter applied as a predictor of unfavorable gestational fetal outcome in small for gestational age and even in appropriate for gestational age fetal growth patterns. An abnormality of cerebroplacental ratio reflect redistributive physiological pattern of cardiac output towards the fetal cerebral circulatory system, and is linked and correlated with intrapartum fetal distress clinical scenarios , raised rates of emergency caesarean mode of delivery and neonatal ICU admission Issues and morbid neurological neonatal outcomes. The value is calculated by division of the pulsatility index parameter of the middle cerebral artery (MCA) by the umbilical artery (UA) pulsatility index: CPR = MCA PI / UA PI, other parameters that are integrated involve the uterine artery doppler parameters , growth centile levels less than the 3rd centile, raising in the detection levels and capacity of fetal restrictive growth patterns [16-20].

Fetal Growth Restriction, is categorized in two clinical categories that are discriminated and classified according in correlation to fetal gestational age [18, 19]. Early onset fetal growth restriction is a severe fetal growth disorder with a typical pattern of increasingly worsening fetal condition necessitating preterm delivery to avoid jeopardizing the fetus inutero, and raising the challenges in management protocols; late onset Fetal Growth Restriction however is clinically more common having a milder form of progression, permitting delivery at or near term. On the other hand late onset Fetal Growth Restriction is mostly unnoticed. Whilst causing the chief percentage of adverse neonatal outcomes [21].

Estimating fetal weight and measuring abdominal circumference is a regular Practice protocol in high-risk gestations. Of corner stone importance to mention is that selecting particularly high risk gestations for sonographic examination i.e. selective scanning depending on presence of risk factors enhances the detection rate of small-for-gestational age fetus, maximally reaching 75% [22]. Leaving a large percentage of cases unrevealed of undetected due to cross-sectional manner of assessing fetal size not noticing the dynamic and changeable process of fetal intrauterine growth pattern. Pediatric practice relies and depends on assessment and evaluation of infant growth in a serial manner. Consequently, it is insightful to apply such mode of practice to assess the fetal growth pattern inutero. Fetal normal ranges and parameters for size measurements given and the observed normal values at previously observed corresponding gestational age [23].Therefore declining growth rate patterns is considered a risk factor for unfavorable outcome [24].

Previous fetal sonographic research performed revealed that in low-risk gestations, Abdominal circumference <10th centile have a higher detection capacity than Expected fetal weight <10th centile. Furthermore, also in low-risk pregnancies, some studies have directly addressed this comparison with conflicting results: while some studies reported better performance of EFW than AC, other studies found no relevant differences. However, this comparison between EFW and AC has not been made for longitudinal growth assessment. In addition, the performance of both longitudinal assessments in the prediction of late FGR as opposed to SGA has not been addressed before. The goal of this research methodology is to perform comparative research approach between Expected Fetal Weight and Abdominal Circumference in the predictive capacity of late onset Fetal Growth Restriction [12].

Patients and Methods:

Between March 2013 and October 2015, a prospective research group of randomly selected singleton pregnancies was recruited to be implemented ,with referral to fetal medicine unit of Ain shams maternity university hospital for routine performance of fetal third-trimester sonographic scan (32 weeks of gestational age) and repeated at 37weeks of gestational age for a further analytical sonographic assessment and analysis of intrauterine growth physiological pattern by obtaining and measuring fetal biometric parameters . Fetal gestational age was determined and sonographically calculated by measuring in an accurate manner fetal crown-rump length in a first trimester scan [20]. Eliminating criteria from the research study were as follows early onset fetal growth restriction (30–34) gestational weeks sonographic expected fetal weight below the 10th centile guided by standard guidelines implemented by the fetal medicine unit [21]. Chromosomally abnormal fetuses with confirmed clinical diagnosis by genetic Investigations performed (i.e karyotyping or displayed comparative Genomic analysis hybridization);morphological defects revealed or alleged at the time zone of performing Sonographic routine examination and with clinical confirmation postnatally [22]. Voluson second-generation E6 have been used in the research study having a rendering tool displating augmented anatomical realistic view and aids to raise depth of perception providing a deep knowledge and clarification of anatomical relations.

Additionally having advanced Volume Contrast Imaging (VCI) with Omni View –improving contrast resolution and visualization of rendered anatomy with enhanced clarity in any plane used for imaging, even when scanning irregularly shaped anatomical structures. The machine is updated with image quality technology, speckle reduction imaging which suppreses speckle artifact while maintaining true tissue architecture.

CrossXBeam technology enhancing tissue and border differentiation and discrimination using a processing technique. HD-Flow supplying a bi-directional Doppler feature providing a sensitive vascular study and reduce overwriting in sonographic reports. Key feature of the machine used to raise study performance efficiency is Sonobiometry which performs a semi-automatic measuring of head (HC and BPD) abdomen and femur, enhancing and raising clinical work flow reducing human operator error.

Results:

Statistical Analysis:

The Student t test and Pearson $\chi 2$ test (or Fisher exact test) were performed for univariate comparisons between FGR and non-FGR cases of quantitative and qualitative variables, respectively. The standards were constructed on a population of 915 pregnancies that were serially evaluated at 32and 37 weeks. A detailed description of the procedure and the parameters

Obtained is provided elsewhere 20. Probability values <0.05 were considered statistically significant.

A total of 998 gestations were integrated in the research according to inclusive research criteria implemented by the research group and were assessed at both at 32 weeks of gestational age and at 37 weeks of gestational age. Of them, 60 gestations were expelled from the research study science Doppler parameters were deficient at 37 gestational weeks and the results are displayed in a tabular manner table [1, 2].

Characteristics	Non FGR(n=897)	FGR(n=41)	P
Age,years	33.2±5.2	33.7±5.6	0.578
BMI (at booking)	23.4±4.1	22.5±3.8	0.147
BMI (at 37 weeks)	28.2±4.3	27.1±4.0	0.093
Obstetric history			
Previous PE	10 (1.1%)	0	1.0b
Previous FGR	15 (1.7%)	1 (2.4%)	0.514b
Previous stillbirth	5 (0.6%)	0	1.0b

Table 1. Demographic data by the time of diagnosing of late onset Fetal Growth Restriction

FGR, fetal growth restriction; BMI, body mass index;
PE, preeclampsia; statistically significant $p < 0.05$ using the Student T test and Pearson $\chi 2$ tests (or Fisher exact test b), as appropriate.

Characteristics	Non FGR	FGR	P
Preeclampsia(late onset)	19 (2.1%)	1 (2.4%)	0.595a
Gestational diabetes	65 (7.2%)	1 (2.4%)	0.354a
Birth weight ,gm	3,341±407.3	2,520±203.4	<0.00001
Birth weight, Centile	48.3±29.2	2.1±1.6	<0.00001
Neonatal metabolic acidosis	23 (2.6%)	2 (4.9%)	0.299a
Adverse perinatal outcomes	145 (16.2%)	8 (19.5%)	0.571

Table2. Obstetrical outcomes in the existance of late onset Fetal Growth Restriction.
FGR, fetal growth restriction; statistically significant $p < 0.05$ using the Student t test and Pearson $\chi 2$ tests (or Fisher exact test), as appropriate.

Discussion:

Although numerous highly developed research approaches are performed in the last ten years, the recognition level of late onset fetal growth Restriction is still clinically insufficient. That particular case scenario is correlated with excessively great percentage of stillbirths in obstetric practice [5, 6, and 7].

In similarity of approach with the routine pediatric infant growth evaluation pattern, an assessment of intrauterine fetal size and various parameters have been suggested to augment and enhance the low clinical and sonographic recognition rate of this obstetric issue as sequential analysis and assessment could uncover in a clear manner the physiological dynamic progression of growth pattern superior than cross-sectional approach for evaluation [10, 11].

Another research group have displayed that quantification of third-trimesteric fetal pattern of growth could be of great value in prediction of low ponderal index in infants. Additionally another research study [23] assessed a group of gestations at hazardous risk of developing small for gestational age fetuses discovering that centiles majorly have a say in the forecast of unfavorable perinatal and obstetric clinical results reflected on the management pathway outcome. On the other hand, our research uncovers the conclusion that an assessment of fetal growth pattern sonographically observed during the last trimester of gestation have a low predictive ability late onset Fetal Growth Restriction [3].

The results obtained from our research study is in harmony with another study performed where usage of centiles did not raise the predictability of hazardous fetal and neonatal outcomes amongst small for gestational age fetuses over predictable Fetal weight-for-gestational-age statistically made charts [24].

Yet, there are various causes that support expected fetal weight over abdominal circumference in clinical obstetric protocols of practice. First of all consistency of assessment value before and after birth, given that neonatal weight and not measured abdominal circumference is the neonatal standard for evaluating growth. Additionally one of the major prospective research study performed reveal superiority of clinical value of estimated fetal weight over abdominal circumference in predictability of small for gestational age fetus [13, 19].

In conclusion, the ease of abdominal circumference measurement does not rule out the requirement of measuring femur length and head circumference as these fetal parameters are used as markers for congenital malformations [20, 21].

The research approach and methodology has restrictions that need to be put in further consideration. As it included only low risk gestations and it could be debated that our research data have restricted exterior strength to be applied the full range and spectrum of gestations. Adittionally, fetal weight calculation relied only on the Hadlock formula, on the other hand other formulas could exist that respect ethnic and racial differences in growth potential with better clearance of our clinical borders for diagnosis Of corner stone importance, our research group only assessed fetal growth during late gestation by means of 2 time points for measurement (32and 37 gestational weeks). A broader range of sonographic assessment and analysis involving second-trimesteric parameters may augment rates of detection as concluded and suggested by another research study [12]. However placental vascular and functional insufficiency could be present in physiologically normal growing fetuses this requires to integrate more wider research on placental functional parameters in integration with fetal growth disorders and capacity [10]. Lastly, our research groups have used centiles for growth assessment that could be modified and reevaluated according to racial and ethnical differences in growth potential [4] .This could have resulted probably in a better research methodology performance.

Conclusion:

Assessment and evaluation of fetal growth pattern during the last-trimester of gestation has a low capacity for prediction of late onset Fetal Growth Restriction , with no statistically significant differences between fetal abdominal circumference and Expected Fetal Weight however it is recommended to perform wider scale research study and correlate and integrate more fetal parameters that could be of value such as cerebroplacental ratio to create solid evidence to be used in practice guidelines .

References:

1. Figueras F, Gardosi J (2011) Intrauterine growth restriction: new concepts in antenatal surveillance, diagnosis, and management. Am J Obstet Gynecol; 204: 288–300.

2. Figueras F, Gratacos E (2014) Update on the diagnosis and classification of fetal growth restriction and proposal of a stage-based management protocol. Fetal Diagn Ther; 36: 86– 98.

3. Savchev S, Figueras F, Sanz-Cortes M, Cruz- Lemini M, Triunfo S, et al (2014) Evaluation of an optimal gestational age cutoff for the definition of early-and late-onset fetal growth restriction. Fetal Diagn Ther; 36: 99–105.

4. Parra-Saavedra M, Crovetto F, Triunfo S, Savchev S, Peguero A, et al (2013) Placental findings in late-onset SGA births without Doppler signs of placental insufficiency. Placenta; 34: 1136–1141.

5. Gratacos E (2013) towards an integrated third-trimester screening in pregnancy. Fetal Diagn Ther; 33: 141–142.

6. Gratacos E, Figueras F (2014) Fetal growth restriction as a perinatal and long-term health problem: clinical challenges and opportunities for future (4P) fetal medicine. Fetal Diagn Ther; 36: 85.

7. Gardosi J, Madurasinghe V, Williams M, Malik A, Francis A (2013) Maternal and fetal risk factors for stillbirth: population based study. BMJ; 346:f108.

8. Pilliod RA, Cheng YW, Snowden JM, Doss AE, Caughey AB (2012) The risk of intrauterine fetal death in the small-for-gestational-age fetus. Am J Obstet Gynecol ; 207: 318.e1–6.

10. Sovio U, White IR, Dacey A, Pasupathy D, Smith GC (2015) Screening for fetal growth restriction with universal third trimester ultrasonography
in nulliparous women in the Pregnancy Outcome Prediction (POP) study: a prospective cohort study. Lancet 2015; 386: 2089–2097.

11. Di Lorenzo G, Monasta L, Ceccarello M, Cecotti V, D'Ottavio G (2013) Third trimester abdominal circumference, estimated fetal weight and
uterine artery doppler for the identification of newborns small and large for gestational age. Eur J Obstet Gynecol Reprod Biol 2013; 166: 133–138.

12. Fadigas C, Saiid Y, Gonzalez R, Poon LC, Nicolaides KH (2015) Prediction of small-for-gestational- age neonates: screening by fetal biometry
at 35–37 weeks. Ultrasound Obstet Gynecol; 45: 559–565.

13. Figueras F, Meler E, Iraola A, Eixarch E, Coll E, et al (2008) Customized birthweight standards for a Spanish population. Eur J Obstet Gynecol Reprod Biol 2008; 136: 20–24.

14. Salomon LJ, Alfirevic Z, Berghella V, Bilardo C, Hernandez-Andrade E, et al (2011) Practice guidelines for performance of the routine mid-trimester fetal ultrasound scan. Ultrasound Obstet Gynecol ; 37: 116–126.

15. Gomez O, Figueras F, Fernandez S, Bennasar M, Martinez JM, et al (2008) Reference ranges for uterine artery mean pulsatility index at 11–41 weeks of gestation. Ultrasound Obstet Gynecol ; 32: 128–132.

16. Basuki TR, Triunfo S, Caradeux J, Eixarch E, Hansson S, et al (2017) Third-trimester conditional references for longitudinal fetal growth assessment. Fetal Diagn Ther ; 43:34-39

17. Trudell AS, Cahill AG, Tuuli MG, Macones GA, Odibo AO (2013) Risk of stillbirth after 37 weeks in pregnancies complicated by small for-gestational-age fetuses. Am J Obstet Gynecol 2013; 208: 376.e1–7.

18. Karlsen HO, Johnsen SL, Rasmussen S, Kiserud T (2016) Prediction of adverse perinatal outcome of small-for-gestational-age pregnancy using size centiles and conditional growth centiles. Ultrasound Obstet Gynecol; 48: 217–223.

19. Hutcheon JA, Egeland GM, Morin L, Meltzer SJ, Jacobsen G, et al (2010) The predictive ability of conditional fetal growth percentiles. Paediatr Perinat Epidemiol; 24: 131–139.

20. Souka AP, Papastefanou I, Pilalis A, Michalitsi V, Kassanos D (2012) Performance of third-trimester ultrasound for prediction of small-forgestational- age neonates and evaluation of contingency screening policies. Ultrasound Obstet Gynecol; 39: 535–542.

21. Triunfo S, Crovetto F, Scazzocchio E, Parra- Saavedra M, Gratacos E, et al (2016) Contingent versus routine third-trimester screening for late fetal growth restriction. Ultrasound Obstet Gynecol; 47: 81–88.

22. Karlsen HO, Johnsen SL, Rasmussen S, Kiserud T (2016) Prediction of adverse neonatal outcomes using size centiles and conditional growth centiles. Ultrasound Obstet Gynecol; 48: 217–223.

23. Pilalis A, Souka AP, Papastefanou I, Michalitsi V, Panagopoulos P,(2012) Third trimester ultrasound for the prediction of the large for gestational age fetus in low-risk population and evaluation of contingency strategies. Prenat Diagn; 32: 846– 853.

24. Vasak B, Koenen SV, Koster MP, Hukkelhoven CW, Franx A,et al, (2015) Human fetal growth is constrained below optimal for perinatal survival. Ultrasound Obstet Gynecol; 45: 162–167.