OP09.11
Maternal hyperoxygenation test in fetuses treated prenatally for severe isolated congenital diaphragmatic hernia

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Aim: Pulmonary hypoplasia and hypertension (PHT) are key problems of newborns with isolated congenital diaphragmatic hernia (CDH). Lung size to head ratio (O/E LHR) and liver position are related to the degree of pulmonary hypoplasia. Prenatal evaluation of the lung vasculature can be either through anatomical measurements, flow patterns, or by measuring vascular reactivity. We evaluated the course and predictive value of the fetal pulmonary artery reactivity to maternal hyperoxygenation (HPVR) in selected fetuses with severe CDH prior to and following fetoscopic endoluminal tracheal occlusion (FETO).
Methods: 38 fetuses underwent FETO around 28 wks and the balloon was removed at 34 weeks. We performed a HPVR test and measured O/E LHR within 2 days before (T1,T3) and after (T2,T4) each procedure. Outcomes included neonatal survival, occurrence of PHT unresponsive to inhaled-NO (iNO).
Results: The HPVR-test and O/E LHR follow different courses around the time of FETO. They are best predictive when HPVR is measured following balloon removal (T4; $p<0.002$). Fetuses who survive have a larger increase in O/E LHR and decrease of resistance in the first branch of the main pulmonary artery than those who died. Both are also predictive of PHT unresponsive to iNO. Discriminant analysis confirms that the LHR and HPVR independently predict outcome.
Conclusions: In fetuses undergoing FETO pulmonary vascular reactivity to oxygen and lung size are independent predictors of neonatal survival and pulmonary hypertension. The hyperoxygenation test merits further study in expectantly managed cases.

Supporting information can be found in the online version of this abstract.

OP10: FETAL GROWTH FROM FIRST TRIMESTER

OP10.01
The influence of maternal demographic features on fetal size in the first trimester

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Objectives: To determine the influence of maternal demographic characteristics and fetal gender on the need to re-date the pregnancy dating using fetal crown-rump length (CRL) measurement.
Methods: A retrospective analysis of 12,000 naturally conceived singleton pregnancies in women with certain dates, assessed in a single fetal medicine unit between 11 and 14 weeks gestation. Maternal age, maternal weight, body mass index, ethnicity, smoking and alcohol history and fetal gender were analysed for their influence on the difference between observed gestational age (GA) calculated from validated CRL charts and expected GA from last menstrual period date. This difference was expressed as the number of days a pregnancy was redated, either as more advanced (positive), or less advanced (negative).
Results: The mean GA difference for all women was −0.90 days (median −0.12, IQR −2.85-2.15, SD 6.38). This was a significant deviation from 0 ($P<0.0001$) (95% CI −1.01 to −0.79).
There was a positive association between advancing maternal age and fetuses that were larger than expected, with fetuses of women aged 40 being on average 3.5 days larger when compared to those of women aged 20. Fetuses of Afro-Caribbean women were also associated with a significantly greater GA difference than those of Caucasian, Asian or other ethnicities. The effects of age and ethnicity were independent of each other. Women who smoked had fetuses smaller than expected, but the independence could not be verified due to the small number of smokers. Maternal weight, body mass index, alcohol intake and fetal gender were not significantly related to GA difference.
Conclusion: Pregnancies of Afro-Caribbean and older women are larger than expected at 11–14 weeks and those of women who smoke are smaller. These findings may reflect real differences on early fetal growth, but may be influenced by other confounders such as timing of ovulation.

OP10.02
The influence of body mass index on first trimester fetal growth

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Objective: Increased maternal body mass index (BMI) is associated with adverse pregnancy outcome. In particular, women with high BMI have higher risks of developing gestational diabetes and delivering macrosomic infants. Maternal age and ethnicity have previously been shown to influence first trimester growth, but it is not known whether maternal BMI has an influence. Our objective was therefore to determine the effect of maternal BMI on fetal growth rate in the early first trimester.
Methods: This was a prospective observational study of singleton pregnancies with certain dates, initially presenting for a transvaginal scan (TVS) before 12 weeks of gestation. Maternal characteristics (BMI, ethnicity, maternal age, obstetric history, abdominal pain and vaginal bleeding) were recorded. Fetal crown-rump length (CRL) was measured at the initial scan, and at subsequent ultrasound assessments. In order to assess fetal growth rates, women with at least two CRL measurements were included in the analysis. A mixed-linear effects model analysis was performed to determine whether BMI influences the rate of change in CRL.
Results: 264 pregnancies were analysed. The median BMI was 23.55 (range 16–45), median age was 32 (17–44) and the proportion of white, black and Asian women was 61.0%, 15.5% and 5.3% respectively. Mean gestational age at first TVS was 56 (range 33–84) days. Studying CRL as a function of gestational age with a mixed-linear effects model showed that this relationship was neither significantly influenced by BMI when modelling BMI as a continuous variable ($p = 0.7529$), nor when modelling it as a categorical variable using the WHO criteria ($p = 0.8904$).
Conclusion: Dating by CRL influences subsequent growth assessment and previous studies have suggested that fetal growth rates may be influenced by ethnicity and age. Our data suggest that maternal BMI is not a significantly influence on early fetal growth.

OP10.03
Gestational SAC biometry in the first trimester: early expression of neonatal biometry?

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Objective: To define normal ranges and equation for gestational sac at 11–14 weeks based on a simple measurement. To study the relationship between gestational sac measurement and birthweight and height.
Material and methods: This study was conducted prospectively in a large screening center. Gestational sac measurement was performed transvaginally at 11–14 weeks of gestation. It was defined on a strict sagittal plane of the uterus as the maximum distance between the two extreme ends of the sac. We used a regression approach to compute reference charts and equations for first gestational sac measurement. The relationship between gestational sac Z score and birthweight and height, expressed as Z scores, was evaluated.
Results: Data were collected in 1324 pregnancies. Gestational sac measurement across gestational age (GA) at first trimester were best described by a linear equation ($p<0.05$). There was a significant correlation between gestational sac measurement and birthweight and height ($p=0.01$). Gestational sac Z score at first trimester was also correlated with maternal body mass index. However, the relationship between birth weight and height remained significant after adjustment on maternal BMI ($p=0.03$).
Conclusion: First trimester gestational sac measurement are correlated with birthweight and height. This could reflect the early expression of fetal growth potential and be partly associated with maternal body mass index, which is already known to impact on prenatal growth.

OP10.04
Correlation between embryo and placental volume from 7 to 10 weeks of pregnancy

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Objectives: The aim of this study was to calculate the embryo and placental volumes between weeks 7 and 10 of gestation, to monitor the difference in their growth patterns and to determine their mutual relationship.
Methods: A total of 70 women with singleton pregnancies between 7 and 10 weeks were included in this study. All volumetric measurements were performed by a single examiner using an endocavitary volumetric probe (3D5-8EK) and an ACCUVIX XQ system (Medison, Seoul). Volume measures of the embryo (EV) and the placenta (PV) were obtained using the VOCAL (Virtual Organ Computer-aided AnaLysis) technique with 30° rotation. The volume data of the embryo and placenta was correlated to the crown-rump length (CRL) using regression analysis. The pattern of growth of EV and PV was also compared using the Pearson's correlation coefficient (r) and Spearman's coefficient of rank correlation (rS).
Results: The mean EV started at 0.56 ± 0.56 ml at 7 weeks and increased to 5.27 ± 2.33 ml at 10 weeks, a growth of 9.4 times in volume. The mean PV started at 4.54 ± 2.29 ml at 7 weeks and increased to 26.32 ± 8.97 ml at 10 weeks, a growth of 5.8 times in volume. Comparison between EV and CRL; and PV and CRL proved significant correlations ($r2 = 0.853$ for EV; $r2 = 0.760$ for PV). The PV was also highly correlated to the EV ($r = 0.789$ and $rS = 0.875$). The distribution of EV and PV and the best fit equation to describe their growth between 7 and 10 weeks are shown in figure 1 and 2 respectively. Figure 3 shows the PV × EV of each patient.
Conclusions: EV and PV are highly correlated, and EV values showed a smaller dispersion than PV values. The increase in EV was almost 2 times the increase in PV in the studied period.

Supporting information can be found in the online version of this abstract.

OP10.05
Relationship between fetal crown-rump length and volume from 11 + 0 to 13 + 6 weeks of gestation by 3D XI VOCAL ultrasonography

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Objectives: To examine the correlation between crown-rump length (CRL) and crown-rump volume (CRV) measured by three-dimensional (3D) ultrasound at 11 + 0 to 13 + 6 weeks of gestation and to evaluate the diagnostic value of CRV for a new approach to the early diagnosis of fetal growth impairment.
Methods: The CRL was measured using conventional 2D ultrasound and CRV using 3D XI VOCAL ultrasound in 100 consecutive singleton pregnancies at 11 + 0 to 13 + 6 weeks of gestation. The linear regression analysis was performed to determine the relation between CRL, CRV and gestational age. Mann-Whitney U-test was used to determine the value of CRV measurement to differentiate growth impairment in 1st trimester ultrasonography.
Results: There were no fetal demises, no fetal anomalies. Forty-four primiparas and 56 multiparas were included in our study. The median maternal age was 31 (range 22–42) years. The CRV gradually increased with gestation ($y= 1.257x - 91.612$; $R=0.780$, $p<0.0001$). The CRL also gradually increased with gestation ($y= 0.162x - 8.141$; $R=0.780$, $p<0.0001$). And it is showed the linear correlation between CRV and CRL in our results ($y=5.632x - 15.776$; $R=0.815$, $p<0.0001$). Nine fetuses were finally categorized to have growth impairment at term (> 10th percentile). Although it was not statistically significant, we could find 2 fetuses by CRV measurement out of the nine growth restricted fetuses.
Conclusion: We could not find any clinical usefulness to measure the CRV in the first trimester to foretell growth impairment in later gestation.