

P11.05

**Quantitative ultrasound tissue characteristics of the cervix in pregnancy**P. Stone<sup>1</sup>, J. Dong<sup>1</sup>, J. Mitchell<sup>1</sup>, R. Hoeben<sup>2</sup>

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**Objectives:** Ultrasound has the potential to describe tissue characteristics of the cervix in addition to length to assess of preterm birth. Reproducible approaches to the quantification of ultrasound derived tissue characteristics of the cervix in pregnancy remain under investigation.

1. To develop a reproducible method for describing gray scale tissue characteristics using 'Image J' software and compare with other methods.

2. To investigate effects of machine settings on gray-scale analysis techniques

**Methods:** A standardised method was developed to define the region of interest of stromal tissue on the posterior aspect of the cervix. One dataset was obtained for 50 healthy nulliparous women at 20 weeks gestation. Pixels in 9 ROIs were analysed using Image J histogram analysis. Further studies were performed on a large dataset of women delivering term or preterm analysed using a number of statistical texture feature approaches including histogram analysis, a co-occurrence matrix method, and texture feature number

**Results:** Little variation of mean gray value of the corresponding ROI in images of different depth, suggested little effect of machine settings on Image J gray scale analysis. Large coefficients of variation were found in each ROI, indicating a high gray scale width of each histogram

**Conclusions:** Analysis of longitudinal data from the database showed changes over gestation but more studies are needed to refine methodology and to correlate with outcomes.

Ultrasound tissue characterisation of the cervix based on pixel intensity analysis can be standardised but require validation prior to clinical application.

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

P11.06

**Ultrasound measurement of central subcutaneous adiposity to assess risk of adverse outcome in pregnancy**N. Kennedy<sup>1,2</sup>, R. Nanan<sup>1</sup>, M. Peek<sup>1</sup>, A. Quinton<sup>1</sup>, R. Benzie<sup>2</sup>, V. Lanzarone<sup>3</sup>

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**Objectives:** Maternal adiposity is associated with adverse pregnancy outcomes.

Body mass index (BMI) is commonly used to assess the risk of obesity related conditions. BMI is an assessment of overall body size and cannot determine adipose tissue distribution. Research has demonstrated, central body adiposity is more predictive than overall fat for disease.

Aim is to determine if ultrasound measurements of subcutaneous fat (SFT) may be used instead of BMI to assess risk of disease in pregnancy.

**Methods:** Prospectively 1137 women enrolled for SFT measured on ultrasound at the cervix placental view at 11–14 weeks and 18–22 weeks gestation.

**Results:** Median (IQR) SFT is 18.64mm (14.87 - 25.32) at 11–14 weeks and 18.53 mm (14.80 - 23.50) at 18–22 weeks. The median (IQR) BMI was 25.5 (22.31 - 30.5), with 43.6 % participants of normal weight, 26% overweight and 28.1% obese.

Pearsons correlation between SFT and BMI was 0.757( $p < 0.01$ ) at 11–14 weeks gestation and 0.736( $p < 0.01$ ) at 18–22 weeks gestation.

**Conclusions:** SFT at 11–14 weeks and 18–22 weeks gestation has a strong correlation with BMI but as BMI increases the variation of SFT measures widens demonstrating the diversity of the distribution of central adipose tissue on the body. Adverse outcome data is currently being collected and may demonstrate SFT is better than BMI as a predictor of obesity related conditions.

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

P11.07

**Longitudinal assessment of lung-to-head ratio in healthy fetuses**R. Ruano<sup>1</sup>, I.S. Britto<sup>3</sup>, P. Javadian<sup>1</sup>, E. Araujo Jr<sup>2</sup>, H. Sangi-Haghpeykar<sup>1</sup>, R. Detter<sup>1</sup>, M. Belfort<sup>1</sup>, W. Lee<sup>1</sup>

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**Objectives:** Lung-to-head ratio (LHR) has been used to predict outcome in fetuses with congenital diaphragmatic hernia. Studies have shown that the LHR may vary throughout gestational age. However, no longitudinal studies assessing the variation of LHR in normal fetuses have been reported. Our primary objective is to describe the first lung-to-head ratio nomogram from a longitudinal study of lungs in healthy fetuses.

**Methods:** We conducted a prospective evaluation of the longest LHRs and area-LHRs of the right and left lungs in 62 healthy fetuses. Nomograms of the LHRs were developed. Mathematical equations were based on multilevel mixed modeling to construct means and standard deviations.

**Results:** Results: A total of 215 ultrasound examinations were performed in fetuses with normal outcomes. The mathematical equations for the expected LHRs by gestational age were:

$$\text{Longest-LHR (right lung)} = 0.1049 + 0.0486 * \text{GA}$$

$$\text{Longest LHR (left lung)} = 0.2942 + 0.0539 * \text{GA}$$

$$\text{Area-LHR (right lung)} = -0.3026 + 0.0526 * \text{GA}$$

$$\text{Areal-LHR (left lung)} = -0.6213 + 0.0508 * \text{GA}$$

**Conclusions:** Prediction models are presented for expected LHRs by gestational age which now can be used to generate the observed-to-expected LHR from a longitudinal cohort.

P11.08

**Comparison of transcerebellar diameter and cisterna magna depth measurements by manual 2D versus 3D automated TCD program**J. Kwon<sup>1</sup>, Y. Kim<sup>1</sup>, H. Kwon<sup>1</sup>, K. Choi<sup>1</sup>, H. Cho<sup>1</sup>, Y. Kim<sup>1</sup>, Y. Park<sup>1</sup>, S. Kim<sup>2</sup>, K. Lee<sup>2</sup>, J. Yoo<sup>2</sup>

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**Objectives:** Transcerebellar diameter (TCD) and cisterna magna (CM) depth are standard measurement used to evaluate posterior fossa abnormality. However, sonographic acquisition of an axial plane is subjective depending on the degree of tilting. Thus, the objective of this study was to compare transcerebellar diameter and cisterna magna depth measurements made manually in 2D versus using 3D automated TCD program.

**Methods:** Total of 20 singleton pregnancies between 20+0 and 24+0 weeks of gestation was included. Multifetal pregnancy, oligohyramnios, fetus with central nervous system anomaly were excluded. Transcerebellar axial plane was obtained to measure TCD and CM manually using 2-6-MHz transabdominal transducer (SamsungMedison Co, Ltd, Seoul, Korea). The process was repeated twice. 3D ultrasound volume of the fetal head was obtained transabdominally with Accuvix V20 Prestige (SamsungMedison Co, Ltd, Seoul, Korea) using 4-8-MHz volume transducer. Volume sweep was initiated in transcerebellar axial plane for measuring biparietal diameter with sweep angle set at 60 degrees. The volume data were subjected to off-line auto TCD program that automatically manipulated the volume to produce transcerebellar axial plane and automatically places calipers for TCD and CM depth measurement. The program was applied twice for each case.

**Results:** The median gestational age at the scanning was 21 weeks and 3 days. In all cases, TCD and CM depth were successfully obtained by 2D manual and 3D automated methods. Median TCD and CM depth were  $21.10 \pm 0.82$  and  $4.70 \pm 0.57$  mm and  $19.56 \pm 1.16$  and  $4.37 \pm 0.53$  mm, respectively, using 2D manual and 3D automated methods. No significant differences in the measurements among 2D and 3D automated method was observed. The mean difference of intraobserver variability for TCD and CM depth were non-significant.

**Conclusions:** The automated TCD program, a novel technique for automated axial plane acquisition and TCD and CM depth measurement using 3D volume data, was feasible and highly reproducible.

P11.09

**Prenatal diagnosis of fetus in fetus (FIF) with MRI and biopsy confirmation**

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Fetus in Fitu (FIF) is a rare abnormality secondary to the abnormal embryogenesis in a diamniotic, monochorionic pregnancy. The presence of a vertebral axis in a fetiform mass is considered pathognomic of FIF. It must be differentiated from a retroperitoneal mature teratoma (RMT). The incidence of FIF is 1:500,000 live births and prenatal diagnosis is possible in 15% of cases only (as in our case)

We present a case of young primi with 6 mnths of pregnancy for routine antenatal scan. A large well-defined, encapsulated hypoechoic lesion containing a well-defined bone was noted in the retroperitoneum adjacent to the lower pole of right kidney. The tentative diagnosis of "Retroperitoneal Teratoma" was put. Antenatal MRI revealed the presence of vertebral axis and the likelihood of FIF.

The newborn delivered at our institute was operated and histopathological examination confirmed the diagnosis of FIF. Hence antenatal MRI is an important new imaging modality and should be used whenever in dilemma.

A basic point to remember is that unlike teratoma, FIF is not a true tumor.

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

P11.10

**A control study of the fetal facial skeletons by skeletal rendering mode of 3D ultrasound**

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**Objectives:** To detect 3D ultrasound appearance of fetal normal and abnormal supermaxilla bone's anatomy using skeletal rendering mode, and to compare the success rate of 3D images in different gestational age groups.

**Methods:** Using 3D ultrasound skeletal rendering mode, the fetal normal supermaxilla bones that include 261 cases with the range from 12 to 40 gestational weeks were reconstructed, and the normal supermaxilla's imaging success rates of different gestational ages were contrasted; and 15 abnormal supermaxilla bones were reconstructed.

**Results:** Big anatomic structures of fetal supermaxilla in 3D images can be shown, but the details can not. Through the X2 test, there was no significant difference in the success rate of displaying among the gestation of 12-15+6, 16-21+6 and 22-27+6 weeks. The success rate during the gestation of 36-40 weeks was the lowest among all the gestation. The success rate of cleft palate with 3D image was 100%.

**Conclusions:** 3D ultrasound can supply more detailed and comprehensive information of fetal supermaxilla bone. The best fit examine weeks are within 16-27+6 weeks.

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

P11.11

**An automatic algorithm to extract first trimester fetal head and trunk structures from 3D volumes**

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**Objectives:** In the prenatal diagnosis of fetal structures, three-dimensional (3D) ultrasound (US) is useful as it provides a multi-planar view. However, an expert must designate the area of interest and the applicable view. The measurement of fetal structures using 3D US is thus usually time-consuming and subjective. Thus, we proposed a model-based segmentation method to automatically segment the fetal head and trunk structures, which assist to measure the fetal parameters for clinical evaluations in the first trimester.

**Methods:** Fifteen static 3D volumes with gestational ages of 11 to 13 weeks were used in the study. First, we construct the statistical shape models of both fetal head and trunk by using the expert-adjusted mesh shapes from training volume images. Second, by using some anatomical feature points in target volume image, we define the local coordinate system to initially align the shape model and image data. Third, we apply the Active Shape Model (ASM) mechanism to adjust the shape model and the global shape of the deformed model can mostly fit to the fetal boundaries.

**Results:** The measurement results were compared with those manually obtained by an expert. The experimental results show