OP04.07
Predicting early pregnancy loss with functional linear discriminant analysis (FLDA)

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Objectives: Of 1000 women attending an early pregnancy unit over 3 months who had at least two ultrasound examinations confirming singleton viability, two classes of pregnancies are considered: ongoing pregnancies and early pregnancy losses. Our objective was to discriminate between these two classes to predict early pregnancy loss. We considered the rate of growth of the crown–rump length (CRL), the mean sac diameter (MSD) and the difference between MSD and CRL as a function of the gestational age (GA).
Methods: Classical linear discriminant analysis (LDA) classifies data by maximizing the ratio of the between-class variation to the within-class variation. FLDA is an extension where the predictor variables are curves (e.g. a variable measured multiple times during pregnancy). Serial observations from each individual are modeled with a spline function (a curved line formed by two or more vertices), parameterized with a basis function multiplied by a 5-dimensional coefficient vector. A training set was used to estimate the mean coefficient vector for each class. New patients can then be classified by determining the class with the closest mean coefficient vector.
Results: 270 patients had at least two measurements for CRL and GA. Nine of these subsequently resulted in early pregnancy loss. It was not possible to discriminate between classes with FLDA using CRL alone. Using MSD we could include 99 patients and mean growth curves of MSD as function of GA for ongoing pregnancies and pregnancy losses did not overlap ($P < 0.0001$). The MSD for early pregnancy loss was smaller at all gestational ages. Moreover, the difference between MSD and CRL could be used to discriminate between ongoing pregnancies and pregnancies destined to fail ($P < 0.0001$).
Conclusions: Using FLDA it is possible to predict early pregnancy loss on the basis of MSD or difference between MSD and CRL for patients in whom MSD and CRL have been measured on at least two occasions.

OP04.08
Does the location of a subchorionic hematoma in early pregnancy affect the miscarriage rate?

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Objectives: Subchorionic hematomas (SCH) are observed on ultrasound in early pregnancy in 0.5% to 22% of women, and some studies suggest that the presence of an SCH may increase the risk of miscarriage. However, the relationship between the location of SCH and subsequent pregnancy outcome has not been examined. We have postulated that the gestational sac (GS) may be more likely to become disrupted by blood tracking from an SCH above it, than if the SCH is near the cervix. The aim of this study was to examine whether the location of the SCH has a bearing on the likelihood of subsequent miscarriage before 12 weeks.
Methods: This was a prospective cohort study of an unselected early pregnancy population. Women attending for a transvaginal scan (TVS) with a singleton viable pregnancy before 12 weeks of gestation were included. An SCH, if observed, was described in relation to the GS, i.e. above, level or below. Pregnancies were followed up for viability at 12 weeks.
Results: Of the 570 women enrolled, 72 (12.6%) had an SCH. The location was above the GS in 16/72 (22%), level with the GS in 28/72 (39%) and below GS in 28/72 (39%). Fourteen women

were excluded from the analysis as they had elective pregnancy termination or were lost to follow-up. Of the remaining 58 women 52 (90%) had a viable pregnancy at 12 weeks while six (10%) ended in pregnancy loss before 12 weeks. Fetal loss rates for an SCH above, level with and below the GS were 0/11 (0%), 5/23 (25%) and 1/24 (4%), respectively ($P = 0.097$).
Conclusions: Our data do not support the hypothesis that the location of the SCH has an effect on the rate of subsequent miscarriage. There is a trend suggesting that the risk is highest if the SCH is level with the GS, but this was not statistically significant. However, the study is limited by the relatively small number of women with SCH and subsequent miscarriage, and larger numbers need to be studied to examine this effect.

OP05: EARLY PREGNANCY II

OP05.01
3D ultrasound volumetry–growth abnormalities of the gestational sac in the first trimester of pregnancy: relation to pregnancy outcome

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Objectives: The aim of the study was to measure the volume of the gestational sac during the first trimester of pregnancy and find any relationship between growth abnormalities of the gestational sac and severe complications of pregnancy in the sense of loss of pregnancy or preterm delivery.
Methods: The volume was measured using 3D ultrasound and VOCAL technique. We measured 335 chorionic cavities and 224 amniotic cavities in 335 singleton pregnancies between the 5th and 14th weeks of gestation. Adverse pregnancy outcome occurred in 34 cases. All measurements were done by two independent investigators.
Results: We found a relation between gestational age and gestational sac volume: $\ln(V\_CD) = 24.443 + 6.5571 \times \lg(t)$ in pregnancies with normal outcome, $\ln(V\_CD) = -1.262 + 1.4082 \times \ln(t)$ in the cases of pregnancy loss. The regression analysis difference is statisticaly significant (F-test, $P < 0.0001$). The measurements of two independent investigators were in strong correlation (0.97). There is strong concordance in dating of gestation using Wisser and Hadlock until the 90th day of gestation; both manners of dating become divergent after the 90th day of gestation.
Conclusions: Volume measurements of the gestational sac in the first trimester could be one of the first methods that could assess the development and prognosis of pregnancy. There is a difference in growth of the chorionic cavity in normal- and abnormal-ending pregnancies. In the previous part of this study we found a strong positive linear correlation between CRL and gestational sac volume in normal singleton pregnancies. It was suggested in previous studies that the growth of the gestational sac is abnormal in cases of miscarriage. At present this method seems to be unlikely to provide useful predictions of the major chromosomal defects.

OP05.02
Can transvaginal ultrasound at 7–9 weeks reliably diagnose chorionicity and amnionicity in twin pregnancies?

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Objectives: Sonographic determination of chorionicity and amnionicity (CA) at the 11–14 week scan is based on the visualization of an inter-twin membrane, number of placental sites and lambda or T