Fetal and placental tissue characterisation and the role of 3D and Doppler ultrasound in lung maturity
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Objective
To investigate the relationship between the gestational age and quantitative assessment of ultrasonic signs of placental tissue, fetal lungs and liver tissue and to correlate Doppler parameters from main stems of the pulmonary arteries and lung volume for determining fetal lung maturity in normal pregnancy and pregnancy with preeclampsia and diabetes.

Methods
The placenta, fetal lungs and fetal liver in 100 normal pregnancies, 50 preeclamptic pregnancies and 50 diabetic pregnancy were examined by ultrasound at 24-41 weeks of gestation. The coefficients of variation were used to characterise the tissue in different groups during pregnancy. Doppler velocimetry was performed in the main stems of pulmonary arteries with HD flow. We used VOCAL techniques to measure lung volumes in normal, preeclamptic and diabetic pregnancy.

Results
The coefficients of variation in mature fetuses were greater than 30% for placentas in-vivo, greater than 35 for placentas in-vitro, greater than 29% for liver tissue and greater than 33% for lung tissue. We found that in mature fetuses the mean peak systolic velocity was higher than 60 cm/sec. and the PI lower than 3.00. The fetal lung volume greater than 60 ml. In mature fetuses with preeclampsia we found higher mean peak systolic velocity in compared to normotensive patients, but in mature fetuses with diabetes we found lower peak systolic velocity in comparison with normotensive patients. We did not find significant difference between lung volumes in all investigated patients. Conclusions. The coefficient of variation values for placentas in-vivo and in-vitro, and fetal lungs and liver increase during pregnancy in normal and preeclamptic patients with increasing gestational age and decrease in diabetic patients. The mean peak systolic velocity in pulmonary arteries increase during pregnancy in normal and preeclamptic patients and decrease in diabetic patients. Lung volumes increase during pregnancy in normal, preeclamptic and diabetic patients.

Conclusion
The coefficient of variation values for placentas in-vivo and in-vitro, and fetal lungs and liver increase during pregnancy in normal and preeclamptic patients with increasing gestational age and decrease in diabetic patients. The mean peak systolic velocity in pulmonary arteries increases during pregnancy in normal and preeclamptic patients and decreases in diabetic patients. Lung volumes increase during pregnancy in normal, preeclamptic and diabetic patients.