Fetal lung maturity in preeclamptic and diabetic patients

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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, elastography 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 140 normal pregnancies, 70 preeclamptic pregnancies and 70 diabetic pregnancies were examined by ultrasound between 22 and 41 weeks of gestation. The coefficients of variation were used to characterise the tissue in different groups during pregnancy. Ultrasound elastography strain measurements of fetal lung stiffness, fetal liver stiffness and fetal placental stiffness is correlated with predictability of fetal lung maturity. Doppler velocimetry was performed in the main stems of pulmonary arteries with HD flow. We used VOCAL II 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. In mature fetuses strain indices(SI) for fetal lung were greater than 0.9, for placentas in vivo greater than 1.0, for placentas in vitro greater than 1.5 and for liver tissue greater than 0.7. We found significant difference in SI in normal pregnancies comparing to preeclamptic pregnancies and diabetic pregnancies. In mature fetuses mean peak systolic velocity was higher than 60 cm/sec and PI was lower than 3.00 and fetal lung volume was greater than 60 ml. In mature fetuses with preeclampsia we found higher mean peak systolic velocity comparing to normotensive patients, but in mature fetuses with diabetes we found lower peak systolic velocity comparing to normotensive patients. We did not find significant difference between lung volumes in all investigated patients.

Conclusion
The coefficient of variation values and strain stiffness (SI) 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.