



Fetal and placental tissue characterisation and the role of 3D and Doppler ultrasound in 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. 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 200 normal pregnancies, 100 preeclamptic pregnancies and 100 diabetic pregnancy were examined by ultrasound at 22-41 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, foetal 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 1, 0, for placentas in vivo greater than 1, 20, for placentas in vitro, greater than 1, 55, for liver tissue greater than 0, 80. We found significant difference in SI in normal pregnancies compared with preeclamptic pregnancies and diabetic pregnancies. We found in mature fetuses mean peak systolic velocity higher than 60 cm/sec. and PI lower than 3, 00 and fetal lung volume greater than 60 ml. In mature fetuses with preeclampsia we found higher mean peak systolic velocity in comparison with 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.

Conclusion

The coefficient of variation values and strain stiffness (SI) for placentas in-vivo and in-vitro, and fetal lungs and liver increase during the pregnancy in normal and preeclamptic patients 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 volume increases during pregnancy in normal, preeclamptic and diabetic patients.