Value of placental volume and vascular flow indices as predictors of preeclampsia and small for gestational age fetuses in the first trimester

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Objective
To evaluate the utility of first-trimester placental volume and three dimensional (3D) vascular flow indices in the prediction of small for gestational age infants, early and late preeclampsia.

Methods
In 1004 singleton pregnancies attending for routine care between 11 to 14 weeks’ gestation we recorded maternal characteristics and medical and obstetric history, biophysical and biochemical markers included in the first trimester screening program for aneuploidy and measured uterine artery pulsatility index. Placental volume, Vascularization Index, Flow Index and Vascularization Flow Index were obtained using 3-dimensional power Doppler imaging and VOCAL techniques. Multiple regression analysis was used to determine which variables were significant predictors for small for gestational age infant, early and late preeclampsia. Predictive model performance was assessed by receiver characteristics curves. Predictive models of small for gestational age and preeclampsia were compared using a two by two approach and subset analysis was performed.

Results
Placental volume and vascular indices were lower in those pregnancies complicated with early or late preeclampsia and also in small for gestational age fetuses. The predictive rate of the model that includes placental volume and vascular indices was 36.8% for small for gestational age. Sensitivity of the predictive model for preeclampsia increased from 41.1% to 49.3% (AUROC 0.745) after the addition of placental volume and vascular indices. Sensitivity of the predictive model for early preeclampsia was 84.8% (AUROC 0.904).

Conclusion
Sensitivity of predictive models for small for gestational age and preeclampsia improves significantly after the addition of placental volume and vascular indices.