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Renal, Femoral, and Middle Cerebral Arterial Blood Flow Velocity Waveforms and Umbilical Venous Blood Gases in Intrauterine Growth Restriction Fetuses

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Introduction: Intrauterine growth restriction (IUGR) may be associated with hypoxia. Chronic fetal hypoxia results in blood flow redistribution in experimental animals. There is an asymmetrical organ growth in nonanomalous IUGR fetuses.

Purpose: The aim of this study was to evaluate regional arterial blood flow velocity waveforms and umbilical venous blood gases in nonanomalous IUGR fetuses.

Material and Methods: Umbilical venous blood samples were obtained by cordocentesis just before a delivery in 18 nonanomalous IUGR and 12 normal pregnancies at 33 to 41 weeks gestation and the blood gas values were measured immediately. Doppler ultrasonography was used to study blood flow velocity waveforms of the renal (RA), femoral (FA), middle cerebral artery (MCA), and umbilical artery (UA) in 18 nonanomalous IUGR and 40 normal pregnancies at 33 to 41 weeks gestation.

Results: IUGR fetal umbilical venous pO2 (mmHg), pCO2 (mmHg), and pH were significant differences from them of normal fetuses (20.1±3.9 vs. 33.8±1.6; $p<0.01$, 46.5±5.3 vs. 35.0±4.7; $p<0.01$, 7.33±0.05 vs. 7.40 ±0.03; $p<0.01$). MCA resistance index (RI) and MCA RI/UA RI ratio were significantly lower in IUGR fetuses than that of normal fetuses (0.72±0.09 vs. 0.82±0.07; $p<0.01$, 0.87±0.18 vs. 1.34±0.15; $p<0.01$). RA pulsatility index (PI) and FA PI were significantly higher in IUGR fetuses than that of normal fetuses (2.56±0.39 vs. 2.12±0.40; $p<0.01$, 2.64±1.18 vs. 1.99±0.39; $p<0.01$).

Conclusions: IUGR fetuses were associated with a pO2 decrease, pCO2 increase, and pH decrease. An alteration in blood flows to kidneys and lower limbs occurred in fetuses affected by IUGR, but blood flow to the middle cerebral artery was maintained.

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Placental morphology and expression of vascular endothelial growth factor (VEGF) in placentae from preterm deliveries in correlation to doppler velocities.

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In view of the localization of VEGF in the human placenta (Siraishi), the aim of this study was to investigate whether there is a relationship between placental histopathology, the immunohistochemical expression of VEGF and doppler velocities in umbilical artery (UA) of preterm infants.

55 Placentae from preterm deliveries were matched in two groups, with or without IUGR. A blinded review of placental histopathology scored lesion in categories of inflammation, infarction and villous histological maturation. From the placental tissue two blocks were processed in standard manner for preparation of paraffin blocks. Sections were incubated following the avidin-biotin peroxidase reaction (Hsu) with a polyclonal rabbit anti-human VEGF (VEGF-Ab-2 Oncogene Cat # PC37 1:40). All slices were stained in the same batch to eliminate inter-batch variation. Twenty fields were examined for each section by an investigator blinded to the tissue identity and scored for localization and intensity of staining (-,+,++,+++). For statistical analysis a χ^2-Test was performed.

From the 55 pregnancies between 24. and 35. weeks of gestational age, 16 were complicated by pre-eclampsia. 33 fetuses were to small for gestational age, this was in correlation to the maternal disease ($p= 0{,}008$). 33 cases showed normal doppler-flow pattern, 16 cases present end diastolic zero flow and 9 cases reverse flow of the UA. This was in correlation to an abnormal development (accelerated for dates) of the villous tree with infarction ($p=0{,}001$). VEGF was identified primarily in the syncytiothrophoblast (in 2 cases -. in 14 cases +. in 30 ++ and in 9 cases with +++ as staining result). There was no statistical correlation between maternal pre-eclampsia, doppler flow pattern or placental histomorphology and VEGF staining results.

We found a correlation between abnormal villous tree development and doppler-flow pattern of the UA. VEGF was expressed by villous syncytiothrophoblast, but without any correlation to clinical data. To reveal the clinical significance of VEGF expression, measurement of VEGF immunoreactivity in umbilical vein serum will be included in this ongoing study.