Assessement of placental perfusion in the preeclampsia L-NAME rat model with high-field DCE MRI

Lemery-Magnin M, Fitoussi V, Siauve N, Pidial L, Autret G, Balvay D, Cuenod CA, Clement O, Salomon Lj

Obstetrics and maternal-fetal medicine, Hopital Necker Enfants Malades, AP-HP, Université Paris Descartes, Paris, France

Objective

To evaluate placental function and perfusion in a rat model of preeclampsia, infused with L-Nitro arginine methyl ester (L-NAME) by Dynamic Contrast Enhanced (DCE) MRI using gadolinium chelates.

Methods

Pregnant female Sprague-Dawley rats were fitted on E16 with subcutaneous osmotic minipumps loaded to deliver, continuously, L-NAME (50 mg/day per rat; case group) or saline solution (control group). DCE MRI was performed on E19 using gadolinium chelates and a 4. 7T MRI apparatus for small animals. Quantitative analysis was performed using an image software program: placental blood flow (perfusion in mL/min/100 mL of placenta), and fractional volume of the maternal vascular placental compartment (ratio between the placental blood volume and the placental volume, Vb in %) were calculated by compartmental analysis.

Results

176 placentas (27 rats) were analyzed by DCE MRI (97 cases and 79 controls). The model was effective, inducing intra-uterine growth retardation, as there was a significant difference between the two groups for placental weights (p<0. 01), fetal weights (p=0. 019) and fetal lengths (p<0. 01). There was no significant difference between placental perfusions in the placentas in L-NAME and control groups (140. 1+/-74. 1 vs. 148. 9+/-97. 4, respectively; p=0. 496). There was a significant difference between the L-NAME and control groups for Vb (53+/-12. 9% vs 46. 7+/-9%, respectively; p<0. 01).

Conclusion

In the L-NAME preeclampsia model, placental perfusion is normal and the fractional blood volume is increased, suggesting that preeclampsia is not always expressed as a result of decreased placental perfusion and highlights the usefulness of MRI for investigating the physiopathology of preeclampsia.