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

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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.