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The measurement of blood flow parameters with deuterium stable isotope MR imaging

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Methods: Because there are no radioactive hydrogen isotopes which can be used for clinical examinations, deuterium as a non-radioactive, freely diffusible tracer has some advantages compared with the radioactive tracers in the measurement of blood flow parameters. A non-invasive technique to estimate the mean tissue blood flow parameter *in vivo* was developed by using deuterium nuclear magnetic resonance (NMR) imaging in rat. We obtained the NMR signal changes from deuterium NMR images in nine male Wister rats after intravenous injection of D_2O and applied exponential curve fitting analyses to calculate blood flow parameters of the brain, heart and skeletal muscle.

Results: While fitting the reducing of the monoexponential function yielded a blood flow parameter of 27.9 ± 1.6 ml/min/100 g tissue weight for the brain and 46.7 ± 3.7 ml/min/100 g tissue weight for the heart, fitting the early reducing of the signal intensity of the biexponential function yielded a blood flow parameter of 95.6 ± 10.9 ml/min/100 g tissue weight for the brain and 108.0 ± 13.1 ml/min/100 g tissue weight for the heart. The mean muscle blood flow parameter determined by the monoexponential uptake function was 43.8 ± 7.3 ml/min/100 g tissue weight.

Conclusions: The blood flow parameter measurement by means of an imaging coil for deuterium is less invasive and reflects the mean tissue blood flow parameter for the entire tissue sample more homogeneously than spectroscopic monitoring.

Key words: brain, heart, skeletal muscle, blood flow, ^{2}D-MRI