Brain tissue water uptake after middle cerebral artery occlusion assessed with CT

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BACKGROUND AND PURPOSE
To study whether computed tomography (CT) can measure the water content of early ischemic edema.

METHODS
The authors obtained cranial CT in 5 groups of rats subjected to 1 hour (n = 8), 2 hours (n = 11), 3 hours (n = 13), 4 hours (n = 13), or 6 hours (n = 14) of right middle cerebral artery (MCA) occlusion. Immediately after CT, the authors removed the rats' brains and determined tissue water content by the dry-wet weight method. They correlated brain x-ray attenuation with brain tissue water content.

RESULTS
Mean brain tissue water content remained constant in the nonischemic left hemispheres at 77.9% +/- 0.6% and increased up to 79.3% +/- 1.0% in the right hemispheres after 6 hours of permanent right MCA occlusion. X-ray attenuation remained constant in the left hemispheres at 75.6 + 2.2 Hounsfield units (HU) and decreased to 71.7 +/- 3.4 HU in the right hemispheres after 6 hours of right MCA occlusion. The decrease in x-ray attenuation correlated significantly with the increase in ischemic brain tissue water content (y = 217.3 - 1.8x x; r = .55, P < .0001). That means that a 1% increase in hemispheric tissue water content causes a decrease in x-ray attenuation of 1.8 HU.

CONCLUSIONS
After MCA occlusion, immediate brain tissue net water uptake is associated with a decrease in x-ray attenuation. CT can monitor ischemic edema in an acute stroke.

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