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Neuroradiology

Low-Grade Gliomas: Do Changes in rCBV Measurements at Longitudinal Perfusion-weighted MR Imaging Predict Malignant Transformation?[1]

Nasuda Danchaivijitr, MD, Adam D. Waldman, PhD, Daniel J. Tozer, PhD, Christopher E. Benton, BSc, Gisele Brasil Caseiras, MD, Paul S. Tofts, PhD, Jeremy H. Rees, PhD, and H. Rolf Jäger, MD

[1] From the Institute of Neurology, University College London, Queen Square, London WC1 3BG, UK (N.D., A.D.W., D.J.T., C.E.B., G.B.C., P.S.T., J.H.R., H.R.J.); Department of Imaging, Charing Cross Hospital, London, UK (N.D., A.D.W.); Imperial College of Science Technology and Medicine, London, UK (A.D.W.); and Lysholm Department of Neuroradiology, National Hospital for Neurology and Neurosurgery, London, UK (G.B.C., H.R.J.). Received December 7, 2006; revision requested February 19, 2007; revision received July 31; accepted August 28; final version accepted September 28. **Address correspondence to** A.D.W. (e-mail: *adam.waldman@csc.mrc.ac.uk*).

Purpose: To prospectively perform longitudinal magnetic resonance (MR) perfusion imaging of conservatively treated low-grade gliomas to determine whether relative cerebral blood volume (rCBV) changes precede malignant transformation as defined by conventional MR imaging and clinical criteria.

Materials and Methods: All patients gave written informed consent for this institutional ethics committee–approved study. Thirteen patients (seven men, six women; age range, 29–69 years) with biopsy-proved low-grade glioma treated only with antiepileptic drugs were examined longitudinally with susceptibility-weighted perfusion, T2-weighted, fluid-attenuated inversion recovery, and high-dose contrast material–enhanced T1-weighted MR imaging at 6-month intervals to date or until malignant transformation was diagnosed. Student *t* tests were used to determine differences in rCBV values between "transformers" and "nontransformers" at defined time points throughout study follow-up.

Results: Seven patients showed progression to high-grade tumors between 6 and 36 months (mean, 22.3 months), and disease in six patients remained stable over a period of 12–36 months (mean, 23 months). Transformers had a slightly (but not statistically significantly) higher group mean rCBV than nontransformers at the point of study entry (1.93 vs 1.31). In nontransformers, the rCBV remained relatively stable and increased to only 1.52 over a mean follow-up of 23 months. In contrast, transformers showed a continuous increase in rCBV up to the point of transformation, when contrast enhancement became apparent on T1-weighted images. The group mean rCBV was 5.36 at transformation but also showed a significant increase from the initial study at 12 months (3.14, $P = .022$) and at 6 months (3.65, $P = .049$) before transformation. Rates of rCBV change between two successive time points were also significantly higher in transformers than in nontransformers.

Conclusion: In transforming low-grade glioma, susceptibility-weighted MR perfusion imaging can demonstrate significant increases in rCBV up to 12 months before contrast enhancement is apparent on T1-weighted MR images.

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