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Assessment of brain perfusion with MRI: methodology and application to acute stroke

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Abstract We review the methodology of brain perfusion measurements with MRI and their application to acute stroke, with particular emphasis on the work awarded by the 6th Lucien Appel Prize for Neuroradiology. The application of the indicator dilution theory to the dynamic susceptibility-weighted bolus-tracking method is explained, as is the approach to obtaining quantitative measurements of cerebral blood flow (CBF) and volume (CBV). Our contribution to methodological developments, such as CBV measurement with the frequency-shifted burst sequence, development of the PRESTO sequence, comparison of different deconvolution methods and of spin- and gradient-echo sequences, and the validation of MRI

measurements against positron emission tomography is summarised. The pathophysiology of brain ischaemia and the role of neuroimaging in the setting of acute stroke are reviewed, with an introduction to the concepts of ischaemic penumbra and diffusion/perfusion mismatch. Our work on the determination of absolute CBF and CBV thresholds for predicting the area of infarct growth, identification of the best perfusion parameters (relative or absolute) for predicting the area of infarct growth and the role of MR angiography is also summarised. We conclude that MRI is a very powerful way to assess brain perfusion and that its use might help in selecting patients who will benefit most from treatment such as thrombolysis.

Dr. Cécile Grandin from l'Université Catholique de Louvain, Belgium, is a laureate of the **Sixth Lucien Appel Prize** awarded by the Lucien Appel Foundation for Neuroradiology. Her original article was published

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