Brain Death: The Role of MR Diffusion Imaging, MR Spectroscopy, and MR Angiography

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Purpose
To assess the role of MR diffusion-weighted imaging, multivoxel proton MR spectroscopy and MRA in the evaluation of brain death.

Materials & Methods
Two patients were included for MR evaluation of brain death while using MR diffusion-weighted imaging, multivoxel proton PRESS MR spectroscopy, and 3D time-of-flight intracranial MRA. The study was performed in a high field strength, 1.5 T Siemens Vision MR imager. One girl, age 3 months, with bacterial meningitis and one boy, age 7 years, with severe head injury, are included in this study.

Results
The diffusion-weighted imaging shows diffuse cortical, brain stem abnormalities consistent with acute infarction. The MR spectroscopy shows diffusely decreased level of NAA, creatine and choline peaks, and presence of lactate. The MRA shows no arterial flow through the brain, but visualization of external carotid arteries. Both patients were confirmed as brain dead according to the clinical protocol. One patient had a nonconclusive SPECT study.

Conclusion
Although the number of patients in this study is too small, the combination of MRA findings of no arterial flow through intracranially, as well as the MR diffusion and spectroscopy findings of acute infarction involving the cerebral cortex and brain stem, may play a major role for evaluation of brain death noninvasively in conjunction with clinical brain death protocol.

References