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The Link between Diagnosis and Therapy

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yond the margin of the contrast enhancement. This paradox makes some sense when one remembers that a contrast-enhancing neoplasm often contains necrotic foci.

Single-voxel spectra are potentially valuable in the differentiation of necrosis from neoplasm for clearly identifiable lesions. If one could distinguish nonneoplastic from neoplastic lesions with a technique such as MR spectroscopy, this would significantly benefit patient care. Meyerand et al do not address this potential advantage. For treatment planning of brain malignancies, we anticipate that 3D spectroscopic MR imaging will be the technique used. This will assist in defining the extent of radiation therapy and treatment boost, selecting patients for focal therapy, directing biopsy to the most metabolically active portion of the neoplasm, and defining patterns of recurrence and response to therapy. We have shown that 3D MR spectroscopy identifies a clear response within the targeted area and progression of disease outside the targeted region in patients who receive high-dose radiation (1, 2).

As new treatment methods become available for this terrible disease, we will be called on to monitor the disease status with increasing accuracy. If one treatment fails, perhaps another will be successful. Perhaps, with the help of MR spectroscopy, we will be able to predict the most favorable regimen for each particular tumor type. As we have seen in other disease states, the treatment options increase in complexity over time. Multidrug regimens are used with improved results in lymphoma, breast cancer, and HIV infection. Selection of the proper regimen will require large trials. MR spectroscopy will play an increasingly significant role in the selection and monitoring of patients within these trials. This has already occurred at the University of California, San Francisco, as several new treatment trials have integrated 3D MR spectroscopy into the treatment arm. The neuroradiologist will need familiarity with the technique of MR spectroscopy as it becomes further integrated into the care of patients with neoplastic diseases of the brain.

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One of the first things a radiology resident learns is that studies that will not change therapy are difficult to justify. In other words, if the treating physician will not use the information gained by a diagnostic test, the test probably isn't worth the expense and risk. Comparing the article by Ertl-Wagner et al in this issue of the *American Journal of Neuroradiology* (page 37) with Schneider et al's earlier study (1) reconfirms this nicely. Both articles document the study of repeat imaging in stroke patients. Schneider et al studied stroke patients in 1991 and found that repeat imaging led to discontinued use of aspirin in only 2 (2%) of 82 subjects. Ertl-Wagner et al, however, studied patients from 1995 to 1996 at a major stroke treatment center and found that repeat imaging changed therapy in 137 (58%) of 238 studies.

Why this difference? Most likely it simply reflects the changing therapeutic options and practice patterns for patients with ischemic stroke. By 1996, a number of options became available or accepted that were not available or accepted in 1991. In the United States, rt-PA was approved for the treatment of acute ischemic stroke in June 1996. Although the window for thrombolysis is perhaps too narrow to allow rt-PA use after repeat imaging, the idea that stroke can be treated at all appears to be having an impact. Some therapeutic interventions mentioned in the Ertl-Wagner article (endarterectomy, anticoagulation, hemicraniectomy) have been available for years but now appear to be used more frequently as stroke is more widely perceived as a disease that benefits from aggressive treatment. Many stroke therapies (ie, antipyretic administration for preventing fever) do not need imaging, but other therapies carry risks, and so imaging is undertaken. Other reasons for the differences between the two studies include the possibility of different underlying patient populations, or simply the habits of the treating physicians. In the 1991 study, some physicians did not significantly alter their treatment decisions based on diagnostic imaging tests, and so probably didn't need to be ordering such tests. By 1996, however, other physicians were frequently using these imaging studies to guide treatment.

The implications for new test techniques are clearly highlighted by these articles. Diffusion/perfusion MR, xenon-CT, CT angiography, CT-perfusion, optical imaging, and other emerging techniques should be widely adopted and used only to the extent that they can change patient management. Given the uncertainty that often accompanies stroke diagnosis, most neurologists welcome techniques that improve diagnostic power. We in neuroradiology must not only provide better diagnostic tools but also tools that improve outcome through better therapeutic choices. More carefully controlled studies, including assessments of the cost-benefit of these new techniques, are sorely needed.