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The study of Rao et al, which assessed the benefits of CT for the diagnosis of appendicitis, is such an example (2).

Some question the benefit of costly imaging studies. When examining the published cost data on stroke patients, however, only about 2% of the overall cost of a stroke is incurred in the acute care phase (3). The varying levels of disability of stroke survivers, some of which can be attributed to treatment choices, account for the largest portion of patient care cost. Almost any imaging and therapy combination that can improve stroke outcome will be worth the initial costs.

As stroke continues to be the target of new therapies, imaging will likely continue to play a role in treatment decision making. In the future we may have an effective stroke therapy so safe that no imaging is needed. Unfortunately we have not yet reached that point. Until we arrive, imaging can and should help guide therapy.

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The Rapidly Expanding Role of MR Imaging Techniques in the Endovascular Treatment of CNS Diseases

In this issue of the *American Journal of Neuroradiology*, studies by Maeda et al and Schick et al (pages 43 and 53) present the opportunity to explore the rapidly expanding potential of MR imaging techniques as adjuncts to the armamentarium used in the endovascular treatment of CNS diseases. For the last 20 years, advances in endovascular therapy have been associated with improvements either in the control or monitoring of interventions. Two examples illustrate this progression. In the late 1970s and early 1980s, many arteriovenous malformations (AVMs) were embolized by using a technique that directly released embolic material into the cervical segment of an internal carotid or a vertebral artery. Delivery of the embolic agent into the AVM was controlled entirely by the pattern of blood flow, and monitoring of the procedure was achieved by intermittently performing film-screen angiography. Now, a variety of catheters make it possible to deliver therapeutic agents directly into an AVM nidus with great precision, and modern digital subtraction angiography (DSA) provides a means for rapid and exquisite documentation of the effect of an intervention on a lesion. With development of detachable balloons, the endovascular treatment of saccular aneurysms became feasible. Lack of control in balloon delivery and release, combined with the inability to establish key morphologic features of many aneurysms, made the treatment difficult, risky, and often ineffective. Advances in catheters and guidewires, availability of the Guglielmi detachable coil, and improvements in fluoroscopic and angiographic equipment now allow many aneurysms to be treated with superb precision and control, high effectiveness, and low risk. In spite of remarkable advances in therapeutic devices, however, fluoroscopic radiography and angiography—significant parts of most interventions—are still performed with incomplete definition of vascular anatomy and little direct insight into the physiological status of the brain. Changing the setting for endovascular therapy from the angiographic suite to the MR environment offers the opportunity to improve the capacity to control and monitor these procedures.

As illustrated by Schick et al and Maeda et al, MR techniques already provide a powerful tool for rapid and accurate assessment of some hemodynamic parameters that cannot be assessed with x-ray fluoroscopy or angiography. Rapidly evolving improvements in the ability to perform MR fluoroscopy, angiography, and device tracking (active and passive), combined with development of interactive interfaces that will allow image acquisition, reconstruction, and display in real time, blend with these physiological capabilities to create an improved environment for the control and monitoring of endovascular procedures. The endovascular treatment of patients with acute ischemic stroke is one example in which the ability to offer therapy in an MR environment would most likely result in increased safety and effectiveness of the treatment. Considerable evidence indicates that there is significant benefit derived from timely delivery of intraarterial thrombolytic drugs to appropriately selected patients with acute ischemic stroke. Optimal use of this treatment hinges largely on 1) rapid and accurate ability to distinguish viable from irreversibly injured brain in individuals with a significant volume of ischemia, and 2) administration of the minimally necessary dose of a thrombolytic drug to restore adequate circulation. Clinical evaluation of neurologic status and imaging techniques based on CT or positron emission tomography (PET) are either insensitive (clinical evaluation and CT) or technically impractical (PET) for stratifying acutely ill patients according to the functional integrity of brain tissue. Additionally, once treatment with intraarterial thrombolytic drugs is instituted, monitoring and control of the therapy are achieved using DSA and clinical evaluation. Both provide only indirect information about tissue perfusion. All of these shortfalls could be eliminated if the diagnostic capabilities of MR (anatomic definition, diffusion and perfusion imaging, temperature mapping, and angiography) were combined with the ability to visualize and manipulate catheters and other devices in the MR environment.

Although many obstacles must be overcome before even basic endovascular interventions can be done in a high-field MR environment, none of these would seem to be ‘‘show stoppers.’’ Because of our background in diagnostic neuroradiology, interventional neuroradiologists are, among all those who perform endovascular treatment of CNS disease, perhaps best suited to lead efforts that will define both the timing and the extent to which the MR environment will replace the angiographic suite. This opportunity offers not only the chance to improve the safety and effectiveness of the treatments offered to our patients but also serves as a legitimate avenue for the next generation of interventional neuroradiologists to assure their presence as important members of the team that will perform these procedures. Our specialty is capable of answering this challenge.

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