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## Brain imaging in stroke.

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### Brain Imaging in Stroke

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Computed tomography (CT) has revolutionized the management of stroke by enabling the radiologist, first, to exclude the stroke mimics such as tumor and subdural hemorrhage, and second, to differentiate between parenchymal and subarachnoid hemorrhage and bland infarction. As such, it is now part of the accepted armamentarium of neurologists and neurosurgeons alike.

While the clinical utility of CT in the initial evaluation of stroke is well accepted, the role of repeat imaging in the patient who has had an acute stroke has, until now, been to document or exclude significant infarction when the initial CT was negative, or to rule out a complication of infarction such as edema or hemorrhagic transformation when the patient's condition worsens.

There have been few articles on the prognostic significance of the various radiologic manifestations of stroke. A recent article by Tomsick et al (1) shows that a hyperdense middle cerebral artery on CT is associated with a worse prognosis than absence of this sign; however, there was even better correlation of outcome from stroke with neurologic deficit at presentation. This finding would suggest that imaging will continue to play a part in the diagnosis and differential diagnosis of stroke, but will not affect prognosis.

In this issue of *AJNR*, Schneider et al (2) present an interesting retrospective review of the need for, and clinical utility of, repeat imaging in 82 of 98 patients presenting with acute stroke. The group is heterogeneous, with 7 patients having intracerebral hemorrhage, and the remainder either lacunar infarct or larger intracranial vascular distribution infarcts. In addition, 24 patients making up their group were part of stroke study protocols that included repeat im-

aging. Thus, only 51 patients with infarct had repeat imaging requested potentially for a variety of clinical reasons. Despite these limitations, there was relatively little benefit to repeat imaging in the population studied.

The series is small and retrospective and does not identify the group most likely to profit from repeat imaging (ie, alteplase- and anticoagulant-treated patients). The small number with heterogeneous indications might not include uncommon causes of stroke such as a new lesion in a patient suspected to have endocarditis. The facts that the study is retrospective and that in at least 16% of cases the indications could not be determined may mask occasions where repeat imaging prevented an inappropriate change in management. Worsening of condition after alteplase or anticoagulant administration may become a major indication for repeat imaging. The authors' series did not include alteplase-treated patients, nor did it identify patients whose stroke was likely caused by proximal embolism.

The article does not indicate how many of the patients whose condition worsened were in stroke studies; two patients did have hemorrhage into the site of infarct, which the authors admit is a small number. The article also does not tell us what additional information (apart from that directly related to the stroke or hemorrhage or a complication of these) the repeat CT or magnetic resonance image provided. We have documented the clinical benefit of repeat magnetic resonance rather than repeat CT in the setting of stroke (3). Therefore, it seems that the repeat CT is of more value in reassuring the clinician than in demonstrating new or additional abnormalities.

As cost becomes more of a factor in patient treatment, studies such as this one are neces-

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sary either to show clinical utility of a diagnostic procedure or to develop diagnostic algorithms. In this way, optimal use of resource with ever-shrinking health care dollars becomes a self-determined, rather than an imposed, reality.

However, absence of proof is no proof of absence. The article of Schneider and colleagues *makes a case for demanding a rationale for repeat imaging but does not prove that repeat imaging is not useful*. A much larger prospective study is needed to reach such conclusions. Even then, a series can only offer an estimate of utility in a given population. It can guide, but not substitute for, clinical judgment.

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