POTENTIAL ROLE OF MR ANGIOGRAPHY IN SELECTING PATIENTS FOR THROMBOLYTIC THERAPY

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Abstract : *Neuroimaging techniques are necessary for the evaluation of stroke which is, one of the leading causes of death and neurological impairment in developed countries. The multiplicity of techniques available has increased the complexity of decision making for physicians. Non-contrast computed tomography (CT) scan is an established imaging procedure for initial evaluation of stroke patients. However, the limited ability of CT for the detection of early ischemia may be disadvantageous as acute therapy must be rapidly initiated. Multimodal CT, incorporating CTA and CTP, may also be disadvantangeous in selected individuals due to concerns regarding contrast load. Magnetic resonance imaging (MRI) has a higher sensitivity than CT for the demonstration of infarcted or ischemic areas. Perfusion and diffusion MRI together with MR angiography (MRA) are very helpful for the acute evalaution of patients with ischemic stroke. For the non-invassive study of extracranial vessels, MRA is less portable and more expensive than ultrasonography but it has higher sensitivity and specificity for carotid stenosis. Current practice guidelines promote rapid evaulation of the stroke patient without mandating specific modalities or techniques. Neuroimaging of acute stroke with multimodal CT or MRI offers prompt diagnostic information that may be integrated into various aspects of patient management. Unlike the prethrombolytic era, clinicians now have several options for neuroimaging evaluation. The selection of a particular imaging modality should be tailored to the clinical scenerio.*

The emergence of very early treatment strategies for acute stroke, such as thrombolysis, raises a number of interesting questions regarding the approach to imaging in such patients. The traditional approach to imaging in acute stroke employs CT, mainly to exclude brain hemorrhage masquerading as infarction. Although more sensitive than CT for detecting brain infarction, the role of MR in the evaluation of patients with very acute stroke, and the impact of early MR imaging on the treatment decision process, has not been adequately studied. MR is attractive for the study of acute stroke because of its increased sensitivity to ischemia and, more recently, because of the introduction of new techniques including MR angiography (MRA) and, most recently, MR diffusion (MRD) and the perfusion (MRP) techniques. MRD requires special coil gradients which can be used to image very early tissue changes, possibly related to cytotoxic edema, occurring within 1 hour of stroke onset. MRP techniques permit analysis of cerebral blood flow and flow metabolism coupling. MRD and MRP are still in the developmental state and are not ready for routine clinical application. However, MRA has already reached the stage of clinical application and, when combined with conventional spin-echo MR, offers the potential for conjoint anatomic and vascular imaging in patients with acute stroke.

The principle of MRA has been extensively reviewed. A variety of phase contrast (PC) and time of flight (TOF) techniques are under investigation. PC is sensitive to very slow flow but is highly subject to complex flow and motion artifacts. PC also requires prolonged acquisition and processing time. For large vessel occlusive disease, 3-dimentional TOF techniques seem to hold the most promise for quick, accurate detection of stenosis or occlusion. 2D TOF may be superior for very low flow states, especially posterior circulation, either the extracranial carotid, circle of Willis, extracranial vertebrals, or basilar artery. Each vessel system analyzed with MRA adds only 8-10 minutes to the standard T2 MR study. Hence, the spin-echo MR combined with MRA of the suspected symptomatic vessel system should take 20-30 minutes in most patients.

Initial studies have shown a high degree of correlation in the degree of extracranial carotid artery stenosis when comparing 3-D-TOF-MRA image with intraarterial digital subtraction angiography (IADSA). More severe degrees of stenosis (>70%) tend to be slightly over-estimated by MRA. A number of potential problems, including motion artifact, have been described. Subacute (4-7 days) thrombus containing methemoglobin can give a false positive "flow" reading, and special sequences are needed to identify dissections. The accuracy of 3D-TOF MRA for detecting intracranial vascular disease is unknown since there have been no correlative studies done with IADSA. Accumulated experience, however, suggests a similar high degree of accuracy of the middle cerebral artery (MCA) bifurcation. MRA also appears highly accurate for detecting vertebral and basilar artery occlusion disease, and occlusive of the posterior cerebral arteries. Technical limitations prohibit accurate imaging of MCA branch occlusive disease, and smaller basilar artery branches including PICA, AICA & SCA. Nonetheless, MRA appears to be highly accurate for detecting occlusion of vessels most often treated with thrombolytic therapy.

CT combined with ultrasound (Carotid duplex plus transcranial doppler (TCD) has been suggested as an alternative to MR/ MRA for the vascular/anatomic evaluation of patients with acute brain ischemia. The advantages and problems of MR versus CT for anatomic imaging of very early stroke have been alluded to above. Ultrasound techniques, while in some ways less cumbersome than MRA, are highly technician dependent and of uncertain accuracy in patients with intracranial occlusive disease, especially vertebral basilar lesion. MRA

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offers the advantage of direct visualization of the occlusive process and is probably more accurate than TCD for detecting vertebral basilar occlusive disease. In some situations ultrasound may compliment MRA. The central point is, however, that if MR becomes the anatomic imaging modality of choice in patients with early brain ischemia, the additional 8-10 minutes required for MRA will become a standard part of the MR evaluation of patients with acute stroke. Assuming, therefore, that anatomic imaging of patients with acute focal neurological deficits remains necessary to exclude brain hemorrhage, the central question to be decided is whether we should continue with our traditional CT approach or shift to MR as the imaging modality of choice in patients with acute stroke. If MR imaging is advantageous over CT, then whether to do MRA becomes a moot point since it adds less than 10 minutes to the data acquisition time.

A final question might be whether vascular imaging is necessary at all in patients with very early brain ischemia. Most, I think would agree that ideally the state of the offending vessel should be known before initiating a specific therapy such as thrombolysis. The concern has been, however, that angiography in the acute stroke patient is not only hazardous but time consuming and may delay treatment for up to two hours. While the BW-tPA acute stroke study did not find angiography in the acute stroke hazardous, it did delay initiation of treatment for 1.5 hours. On the other hand, 25% of patients in that study were excluded from thrombolytic therapy on the basis of angiographic criteria (i.e., eligible by clinical and CT criteria). These results suggest that it will be difficult to select the best candidates for very early intravenous thrombolytic therapy on the basis of the clinical examination only. The great appeal of MRA, therefore, is the ability to acquire not only anatomic data but also vascular imaging in a very brief period of time so that a specific treatment plan can be initiated. When combined with MRD, treatment might be selected on a more physiologic rather than clinical (time from onset, severity of deficit) or anatomic (presence or absence of occlusion) basis.

RECOMMENDED READING

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RENAL TRANSPLANTATION OUTCOMES: A COMPARATIVE ANALYSIS BETWEEN ELDERLY AND YOUNGER RECIPIENTS

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Renal transplantation is presently the best treatment for end-stage renal disease, although considered contraindicated for elderly patients. However, more investigation is needed due to higher life expectancy rates of the general population and the increasing number of over 60-yr-old patients with chronic renal failure dependant upon dialysis. This study aims to determine graft and patient survival rates of renal transplant patients 60 yr and older compared to a younger group (50–59 yr old). Relevant pre- and post-transplant clinical data related to graft and patient survival in both groups were also investigated. Three-hundred and twenty consecutive renal transplant patients were enrolled in this study and grouped based on age at the time of the transplantation: one-hundred and ten patients at or over 60 yr old (elderly group) and 210 patients ranging from 50 to 59 yr old (younger group). There were no statistical differences in either group regarding clinical characteristics and immunological risk factors. The incidence of acute rejection was higher in the younger group (37.6%) than in the elderly (22.7%) (p = 0.01). Censored to death graft survivals at five yr were respectively 86.7% for patients e" 60 yr and 82.1% for patients 50–59 yr old (p = 0.49). Patient survival rates at five yr were respectively 76.2% for patients e" 60 yr and 81.6% for patients 50–59 yr old (p = 0.33). Our data show that renal transplantation for elderly patients has similar results to those found in younger individuals, this age, itself should not be a contraindication for transplantation.