Intra-Arterial Thrombolysis in Acute Ischemic Stroke

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Introduction

Intra-arterial (IA) thrombolysis provides an alternative to intravenous (iv) thrombolysis in selected patients with acute ischemic
stroke. Recent advances in the field of neuro-interventional radiology, with the development of extremely soft, compliant microcatheters and steerable microguidewires, along with high-resolution fluoroscopy and digital imaging, and nonionic contrast agents, have made it feasible and safe to access the major intracranial blood vessels around the circle of Willis from a percutaneous transfemoral approach under local anesthesia. Rapid local delivery of fibrinolytic agents is now feasible using these techniques and is performed at many major medical centers in selected patients with acute cerebral ischemia.

**INITIAL PATIENT SELECTION FOR DIRECT INTRA-ARTERIAL THROMBOLYSIS**

The initial clinical and computed tomography (CT) scan selection criteria for IA thrombolysis are similar to those for intravenous tissue plasminogen activator (t-PA) (1). Intra-arterial thrombolysis has been used most successfully in patients with acute middle cerebral artery (MCA) occlusion. There is evidence that the treatment window for IA thrombolysis extends to at least 6 h from stroke onset in patients with MCA occlusion. Other potential candidates for IA thrombolysis include patients with extracranial internal carotid artery (ICA) occlusion, ICA “T” occlusions that involve the distal carotid and proximal MCA, and basilar artery occlusion.

Patients who present with an acute stroke within 6 h of symptom onset should initially be examined by a neurologist familiar with the intravenous t-PA selection criteria. The baseline National Institutes of Health Stroke Scale Score (NIHSS) in most patients considered for IA thrombolysis is greater than 10. Baseline laboratory evaluation should include a complete blood count with platelets and differential, coagulation studies, including thrombin time, activated partial thromboplastin time (aPTT), international normalization ratio (INR), activated clotting time (ACT), fibrinogen, plasminogen, and α2-antiplasmin levels, serum electrolytes, random blood glucose, troponins, creatine kinase, creatine kinase MB fraction, and an electrocardiogram. Additionally, laboratory studies to determine reversible stroke risk factors may be drawn at this time, in order to limit the number of posttreatment blood draws. These additional laboratory investigations may include a super sensitive C-reactive protein, plasma homocysteine level, and a lipid panel if the patient has not eaten in at least 8 h.

A CT scan is performed to exclude hemorrhage and major early signs of infarction, which would preclude thrombolytic therapy. The precise site of arterial occlusion in patients with acute ischemic stroke of less than 6 h duration cannot be determined solely on the basis of a neurological examination (NIHSS) and CT scan (2). In about 33% of patients with acute stroke caused by occlusion of the MCA, the CT scan will demonstrate a hyperdense MCA sign signifying thrombus in the MCA (Fig. 1) (3). In addition, visualization of a hyperdense