The Neurovascular Frontier

Hemorrhagic and ischemic stroke affects 800,000 patients per year in the United States. Treatment of patients with acute ischemic stroke secondary to large-vessel occlusion requires urgent treatment. The efficacy of intravenous tPA therapy is well documented. Recent clinical data support extending the time window for administration from 3 to 4.5 hours, although the margins for improvement are narrow. Combined intravenous and intra-arterial therapy—bridging therapy—appears to increase large-vessel revascularization. Mechanical revascularization techniques, such as the Merci retriever and Penumbra aspiration, can drive large-vessel revascularization rates to 80%. Yet, the functional outcomes at 90 days for these patients (Barthel index, Rankin scale, NIHSS score, or composite indices) are below 50% for favorable outcomes. Although there may be preservation of cortical function, small-vessel perforator occlusions on the middle cerebral and basilar artery are less forgiving and can cause profound disability even in the face of successful large-vessel revascularization.

The new techniques for intracranial vessel recanalization described in this issue represent the best tools available for vessel-establishing revascularization. We know that the best outcomes in acute stroke patients are achieved when there is rapid vessel recanalization, although this does not guarantee a good outcome. The Merci and Penumbra devices have improved revascularization rates over thrombolytic therapy alone. Angioplasty and stenting for acute vessel occlusions appear to show exciting early results, and continued enrollment in the SARIS trial is eagerly awaited.

For hemorrhagic stroke, the situation is different. Ruptured cerebral aneurysms—50,000 in North America each year—can be treated with detachable platinum coils alone or in combination with intracranial stents to cover the aneurysm orifice. In this issue, Fiorella et al describe a braided nitinol stent that, when placed into the parent vessel harboring an intracranial aneurysm, diverts flow past the aneurysm orifice resulting in aneurysm thrombosis. This may represent a huge step forward in the treatment of intracranial aneurysms by changing the treatment paradigm from intra-aneurysm filling to flow diversion by treating the parent vessel.

The key to hyperacute patient triage in acute ischemic stroke patients is perfusion imaging. Although MR imaging techniques are superior for detecting acute stroke, incorporating MR into routine care of stroke patients as a screening tool is difficult. CT with perfusion has become the tool of choice for urgent ischemic and hemorrhagic stroke intervention. CT perfusion imaging can provide enough information to pinpoint patients with large vessel occlusions and prevent those with nonviable brain from being revascularized.

The treatment of cerebrovascular disease still remains a wild frontier. However, the tools we have presently, and those under development, may revolutionize our treatment methods and patient outcomes. We thank L. Nelson Hopkins, MD, FACS, and the SARIS investigators; Colin P. Derdeyn, MD; John P. Deveikis, MD; David Fiorella, MD, PhD; Michael Kelly, MD; Henry Woo, MD; Catalina C. Ionita, MD; Eve A. Guterman; Vincent V. Truong, MD; and Alex Abou-Chebl, MD, for their contributions to this issue. Additionally, we are grateful for the contributions from Michel Henry, MD; Antonios Polydorou, MD; Isabelle Henry, MD; Michèle Hugel, RN; Olusegun O. Osinbowale, MD; Yung-Wei Chi, DO; and Ajay J. Kirtane, MD, to this month's department articles. ■

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