

Cerebral vascularization

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THE management of disorders of the cerebral vasculature has undergone dramatic changes in recent years due to improvements in imaging, the introduction of endovascular techniques, and improvements and refinements in surgical techniques. This issue of *Neurosurgical Focus* is presented to update the reader on many new important advances in the treatment of disorders of the cerebral vasculature. The history of revascularization of the cerebral circulation is discussed, and the origins of carotid artery surgery are reviewed. Many lesions and conditions that are familiar to clinicians are examined with the perspective of new imaging and treatment techniques. New diagnostic capabilities, including the measurement of blood flow in individual vessels, offer rational treatment paradigms for treating disorders of the cerebral vasculature. Moreover, more careful documentation of the natural history of subgroups of patients according to the presence of anatomic lesions as well as physiological and blood flow abnormalities are now being reported more carefully in the hope of introducing more physiologically based treatment paradigms. Specialized techniques of cerebral vessel reconstruction are now complemented by advances in endovascular therapy that may offer alternative treatment strategies for certain lesions using a less invasive approach.

In the first section, Vilela et al. review the historical development of cerebral vascularization and superficial temporal artery–middle cerebral artery (STA-MCA) bypass, including early experimental work that preceded its use, as well as the first application of the technique in humans, and its current status. Dumont and colleagues provide a comprehensive review of a variety of vascular lesions, their natural history and the rationale for either endovascular or open surgical treatment. Garrett et al. discuss the extracranial–intracranial (EC–IC) bypass trial and note many of the concerns surrounding the trial, especially the selection of patients who were included in the trial. Patients were largely selected on the basis of anatomic lesions without consideration of the physiological and cerebral blood flow effects of the lesions. The cerebral blood flow studies that are now available are widely believed to be critical in selecting patients who are at a high risk of subsequent ischemic events based on poor collateral vessel compensation for vascular lesions; such studies therefore may help

select a subset of patients more appropriate for consideration for bypass surgery.

The next section focuses on the technical aspects of a variety of treatments for cerebrovascular disease, including the methods and potential pitfalls of bypass surgery and endovascular procedures with articles describing detailed methods for employing different types of bypass constructs. Zuccarello et al. describe their experience with radial artery grafts, including the indications for their use as well as the technical aspects of performing the procedure with specific case examples. Langer and associates provide a comprehensive review of their experience using the excimer laser-assisted nonocclusive anastomosis method, developed by Tulliken as a technique for performing high-flow bypass procedures, with a novel and ingenious method that allows the surgeon to construct bypass grafts without lengthy vascular cross-clamp times. Ashley et al. provide a valuable case series of flow measurements in short vein grafts from the STA trunk to the MCA using the quantitative magnetic resonance imaging vascular flow method developed by Charbel. A series of articles follows which describes technical aspects of a number of bypass graft procedures including the use of the lateral femoral circumflex artery as an alternate graft source, anatomical considerations related to using the occipital artery, harvesting the radial artery using an endoscopic technique, and high-flow vein grafts for bypass of skull base lesions. Aspects of carotid stenting using distal protection devices are then discussed along with treatment of supraclinoid artery blister aneurysms and the use of wingspan stents for vertebrobasilar lesions.

The next section contains a number of articles on the use of surgical revascularization including direct and indirect bypass techniques for the treatment of moyamoya disease. Mesiwala et al. describe a series of adult patients with moyamoya disease in the western United States. The authors include information on patient demographic characteristics, mode of presentation, treatment with revascularization surgery, and include a discussion of long-term clinical outcome as well as graft patency and blood flow results. Steinberg and colleagues describe an extensive experience with different bypass techniques in a North American series of pediatric patients with moyamoya. Smith et al. describe a subset of patients from their exten-

sive experience from the Children's Hospital in Boston who initially presented with unilateral moyamoya. These authors conducted careful follow-up and identified a subset of patients who initially presented with unilateral disease, but in whom moyamoya vascular changes later developed on the other side. A number of important associations with early progression to bilateral disease are indentified.

In the last several articles, Curtis et al. review the history and techniques of carotid endarterectomy, including a comparison of the standard and eversion technique, and

Reichman et al. discuss their experience in treating a patient who has lived with an STA-MCA bypass graft for the past 30 years.

We hope that this issue of *Neurosurgical Focus* will serve as a basis for future developments and comparison studies of endovascular and surgical techniques in treating cerebral vascular lesions. Lessons learned from experienced practitioners will help in the development of newer and safer technologies for treating these disorders in the future.