Cerebral Revascularization

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Despite decades of critical analysis, the precise indications for cerebral revascularization remain poorly defined. It is clear that some patients undergoing therapeutic carotid artery (CA) sacrifice for the management of unclippable intracranial aneurysms or skull base neoplasms will require revascularization to prevent or reduce the risk of cerebral infarction.^{4,11} Nevertheless, the decisions of when to perform this procedure and what type of bypass to undertake in these cases remain debated. The question of whether revascularization should be conducted in cases involving ischemic disease is even more controversial.^{1-3,5,8}

This issue of **Neurosurgical Focus** is devoted to the topic of cerebral revascularization, assembling a collection of articles from noted experts in this field. The papers address many of the challenging and important issues yet to be defined in this controversial area.

In the lead article, Friedman and Piepgras review their extensive 15-year Mayo Clinic experience with saphenous vein grafts used for cerebral bypass. The trends that they identify regarding the decreasing number of such procedures are important both in terms of patient management and implications for future neurosurgical training. The reader should also note well the mention of several aneurysms requiring treatment with an intraoperative bypass that had not been planned preoperatively. As the incidence of surgically treated aneurysms decreases because of improving endovascular techniques, our facility with revascularization will likely continue to diminish. The concentration of these complex cases in centers of excellence where "unanticipated" revascularization can be performed when appropriate will become increasingly important if a meaningful level of technical competence with these demanding procedures is to be maintained.

In a pair of excellent review articles, Liu and colleagues describe a variety of strategies for the establishment of high-flow interpositional grafts and also describe the various conduits available for cerebral revascularization. Their discussion of the advantages and disadvantages of each approach will be of interest to anyone performing revascularization procedures and nicely complements the experience described by Friedman and Piepgras. Following these reviews, O'Shaughnessy and coworkers share with us an important description of their management philosophy for giant anterior circulation aneurysms. In this excellent article the authors elegantly illustrate a management strategy that has proven successful in the hands of one of

the foremost cerebrovascular neurosurgeons in practice today. The thoughtful approach, which has clearly been refined repeatedly based on a careful analysis of practical experience, deserves detailed study.

Shifting gears to address the issue of preoperative assessment prior to CA sacrifice in patients with advanced head and neck cancer, Dare and associates describe their paradigm for balloon test occlusion (BTO) with hypotensive challenge. The question of which patients undergoing CA sacrifice will require revascularization remains a matter of debate, and at the present no single test or combination of studies can absolutely predict that a patient will tolerate CA sacrifice.⁷ This article, presented by the experienced group at Buffalo, highlights this point as one of their patients suffered a fatal ischemic insult despite passing the BTO. Continuing on the topic of CA occlusion in the setting of head and neck cancer, Feiz-Erfan and colleagues report the Barrow Neurological Institute experience involving bypass followed by radical excision of aggressive squamous cell carcinoma. As chemotherapy regimens and radiotherapy techniques improve, the neurosurgeon may be called upon to treat an increasing number of patients in whom more advanced neoplastic disease processes involve the CA.^{9,10} This paper nicely highlights the difficulties associated with managing this complicated subgroup of patients.

Turning to the issue of revascularization for ischemic disease, Melgar and Weinand describe their unusual experience in performing revascularization of the external carotid system in the treatment of postural cerebral ische-

mia in patients with bilateral internal CA occlusion. Next, Tummala, et al., describe a large contemporary series of superficial temporal artery–middle cerebral artery anastomoses for occlusive cerebrovascular disease in cases treated at a center that has continued to champion the procedure in the management of patients refractory to maximal medical therapy. The final article represents an important contribution from Grubb and coworkers detailing the Carotid Occlusion Surgery Study project, a newly organized randomized trial examining the efficacy of extracranial–intracranial bypass in the setting of unilateral symptomatic CA occlusion.⁶ Ultimately, it will likely be through this type of careful analysis that we may finally answer the question of when revascularization for ischemic disease should be performed.

In summary, the purpose of this issue of **Neurosurgical Focus** is to present the state-of-the-art thinking in the controversial field of cerebral revascularization. The articles, which touch on many aspects of this topic, underscore several important points that deserve to be emphasized.

1) A thoughtful and carefully studied approach is essential when treating patients in whom revascularization may be required for complex intracranial aneurysm, skull base tumor, or occlusive cerebrovascular disease. Because we lack hard scientific data to guide us in the management of these issues, we must rely on the carefully documented experience of individual surgeons who have dedicated their efforts to the management of these patients.

2) Cerebral bypass may unexpectedly be required intraoperatively, even by experienced surgeons; therefore, it is appropriate for neurosurgeons managing these complex disease processes to be facile with the various methods of cerebral revascularization.

3) With the increasing role of endovascular therapy in the treatment of intracranial aneurysms and occlusive cerebrovascular disease, the trend away from open microsurgery will continue, and fewer neurosurgeons will likely be competent to treat these problems. Therefore, referral of such complex patients to centers of excellence will be critical in the future.

4) It is the responsibility of those neurosurgeons who continue to treat these problems to attempt to refine our understanding of when to perform cerebral bypass and what type of bypass to perform when surgical revascularization is indicated.

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