Cerebral Aneurysm Therapy

Healthy debate regarding optimal aneurysm treatment continues in the wake of ISAT.1 Publication of the ISUIA2 has revealed the benign nature of small (<7 mm) anterior circulation aneurysms and this will likely alter treatment strategies. Technological innovation continues with new coil designs incorporating bioactive materials such as fibroblast growth factor,3,4 collagen,5 and polyglycolic acid/lactide.6 All of these materials have been shown to increase cellular response and healing potential in experimental aneurysms, and the widespread clinical use of Matrix coils6 (Boston Scientific) has shown promising results in humans, although there have been anecdotal reports of an increase in embolic complications. The challenge of treating wide-necked and complex aneurysms has been the focus of innovation in stents and stent-assisted techniques. The new Neuroform stent (Boston Scientific) is the first such device designed specifically for intracranial use and is rapidly gaining acceptance as an adjunct to the coiling of wide-necked aneurysms.8,9 The introduction of more endovascular hardware can, however, increase the complexity and complication rates of these treatments.10 The dissemination of new imaging techniques such as rotational digital subtraction angiography will allow more accurate volumetric analysis of aneurysms to guide the use of next-generation coils, many of which have expansile properties.11 It is hoped that computational fluid dynamics and particle velocimetry will soon help predict the hemodynamic response to endovascular therapies.12 There have been more reports of long-term follow-up of coiled aneurysms, indicating up to 21% recurrence rate.13,14 Significant predictors of recurrence include size >10 mm, incomplete initial occlusion, duration of follow-up, and treatment during the acute rupture phase.13 It has also become clear that complication rates in aneurysm therapy are less in high-volume centers15 and that a neurovascular team, comprised of neurosurgeons and endovascular therapists working together, is essential to successfully treat the spectrum of intracranial aneurysms.16–19

Carotid Angioplasty and Stenting

CAS is becoming an increasingly popular procedure, both inside and outside the numerous comparison trials with carotid endarterectomy now underway. Although the results of the largest and most ambitious of these studies, the Carotid Revascularization Endarterectomy versus Stent Trial (CREST), are several years away, an updated worldwide survey20 has shown that >12 000 procedures have been performed, with technical success rates close to 99% and total stroke and death rates <5%. The increasingly common use of cerebral protection devices can lower the complication rates to <2%,21,22 but the quality of the evidence has been criticized23 and the devices are expensive and can themselves lead to complications.22 The results of one industry-supported stent trial (SAPPHIRE) have been presented,24,25 showing favorable comparisons to CEA in high surgical risk patients, but many of the patients were asymptomatic from their carotid disease. Until the CREST results are available, there is still no strong evidence to support the use of CAS outside of clinical trials or in patients who are candidates for CEA.24,26 Angioplasty and stenting of intracranial atherosclerotic disease remains a feasible but relatively high-risk procedure27

Thrombolysis for Acute Stroke

The evidence supporting the use of intra-arterial thrombolysis for acute stroke is still thin, with only the dated guidance of the PROACT trials available.28 Better-designed studies using current thrombolytic agents are clearly needed29 and in the interim, the procedure should be performed only in experienced centers on highly selected patients.30 There is still no evidence to support the superiority of intra-arterial (IA) over intravenous (IV) thrombolysis. A retrospective review of patients from PROACT II has shown that the use of the Alberta Stroke Program Early CT Score (ASPECTS) system may help to select patients with acute infarcts who will benefit from IA thrombolysis.31 Those patients with a score >7 were 3 times more likely to have an independent functional outcome than those scoring <7. Newer, third-generation thrombolytics such as tenecteplase and reteplase are becoming available, boosting longer half-lives and better penetration into thrombus matrix, which may translate into better recanalization rates in acute stroke.32 Snare retrieval and aggressive mechanical clot disruption may be therapeutic options when chemical thrombolysis fails.33,34 The increasingly routine use of multislice CT to perform cerebral blood flow studies concurrent with CT angiography can facilitate rapid,
effective thrombolytic therapy. The goals of reliable imaging of the reversible ischemic penumbra, and prediction of eventual outcome, are not yet attainable in most clinical settings.

**Arteriovenous Malformations**

There have been few new developments in the endovascular therapy of brain arteriovenous malformations (AVMs). Onyx is gaining popularity as a more controllable embolic agent than n-butyl-cyanoacrylate (NBCA). An interesting review of Spetzler-Martin grade IV and V AVMs from the Barrow Institute noted a hemorrhage rate of only 1.5% per year in 73 patients, compared with a 10.4% rate in those who had undergone incomplete therapy, implying that partial treatment of large, complex AVMs may be more damaging than no treatment. The authors reiterate that there is no evidence that partial embolization of AVMs offers any decrease in bleeding rates, and they do not support palliative therapy of any kind unless an intranidal aneurysm is identified or there is a progressive neurological deficit from a vascular steal or hemorrhage. These selection criteria may help to keep the combined morbidity and mortality of these lesions (17% and 22%, respectively) relatively low.

**References**


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