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### **Preface**

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Arun Paul Amar and Sean D. Lavine

### **Mechanical Embolectomy**

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Jeffrey M. Katz, Y. Pierre Gobin, Alan Z. Segal, and Howard A. Riina

Mechanical embolectomy in acute ischemic stroke employs the use of novel endovascular devices to revascularize occluded intracerebral arteries. Devices like the Merci Retriever and other endovascular snares, laser thrombectomy and rheolytic/obliterative microcatheters, intracranial balloon angioplasty and stenting, and intra-arterial and transcranial ultrasound-enhanced chemical thrombolysis are intended to improve tissue rescue and diminish reperfusion hemorrhage while broadening the population eligible for therapy. Patient selection with MRI- and CT-based stroke protocols can detect tissue at risk and may obviate the classic limitations of the stroke therapeutic time window. These devices are being developed and modified at a rapid pace, requiring mounting endovascular expertise, and are being used successfully alone or in conjunction with chemical thrombolysis with relative safety.

### **Clipping or Coiling of Cerebral Aneurysms**

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Gavin Wayne Britz

The management of a patient with a cerebral aneurysm is complex, and two accepted treatment modalities are now available. The superiority of either of the treatment options has not been defined, but data are now available with regard to the safety and efficacy of each modality and can be used to decide what is best for individual patients when combined with other important variables, such as the patient's expected longevity, specific aneurysm factors (eg, size, dome-to-neck ratio, location), and operator's experience. This complex decision entertaining all the variables should ensure that patients receive the most appropriate care. New developments in the endovascular management of cerebral aneurysms are likely to alter this algorithm.

### **Healing of Intracranial Aneurysms with Bioactive Coils**

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Lei Feng, Fernando Vinuela, and Yuichi Murayama

Inadequate healing is an important mechanism for aneurysm development and recanalization after embolization. Matrix coils have been shown by experimental studies to enhance vascular repair and fibrosis, thus reducing the risk of recanalization. The clinical application of Matrix coils represents the transition from pure mechanical occlusion to adjunct biologic healing of aneurysms. Our preliminary clinical experience reveals

evidence of a healing response in aneurysms treated with Matrix coils. This technology can be further improved through the incorporation of new knowledge on the molecular pathogenesis of aneurysms and the cellular and molecular mechanisms of healing.

### **Endovascular Treatment of Cerebral Vasospasm: Transluminal Balloon Angioplasty, Intra-Arterial Papaverine, and Intra-Arterial Nicardipine**

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Brian L. Hoh and Christopher S. Ogilvy

Cerebral vasospasm is still one of the leading causes of morbidity and mortality from subarachnoid hemorrhage. Vasospasm refractory to medical management can be treated with endovascular therapies, such as transluminal balloon angioplasty or infusion of intra-arterial vasodilating agents. In our review of clinical series reported in the English language literature, transluminal balloon angioplasty produced clinical improvement in 62% of patients, significantly improved mean transcranial Doppler (TCD) velocities ( $P < .05$ ), significantly improved cerebral blood flow (CBF) in 85% of patients as studied by  $^{133}\text{Xenon}$  techniques and serial single photon emission computerized tomography, and was associated with 5.0% complications and 1.1% vessel rupture. Intra-arterial papaverine therapy produced clinical improvement in 43% of patients but only transiently, requiring multiple treatment sessions (1.7 treatments per patient); significantly improved mean TCD velocities ( $P < .01$ ) but only for less than 48 hours; improved CBF in 60% of patients but only for less than 12 hours; and was associated with increases in intracranial pressure and 9.9% complications. Intra-arterial nicardipine therapy produced clinical improvement in 42% of patients, significantly improved mean TCD velocities ( $P < .001$ ) for 4 days, and was associated with no complications in our small series. We have adopted a treatment protocol at our institution of transluminal balloon angioplasty and intra-arterial nicardipine therapy as the endovascular treatments for medically refractory cerebral vasospasm.

### **Antiplatelet Therapy in Neuroendovascular Therapeutics**

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David Fiorella, Lucie Thiabolt, Felipe C. Albuquerque, Vivek R. Deshmukh, Cameron G. McDougall, and Peter A. Rasmussen

Our understanding of the pharmacology of antiplatelet therapy continues to evolve rapidly. Although the existing data are primarily generated in the setting of interventional and preventative cardiology studies, these data may be extrapolated to guide the rational application of these agents in neuroendovascular procedures. Platelet function testing represents an increasingly available and practical method by which to verify the adequacy of therapy and guide clinical decision making. The optimal application of these agents will undoubtedly improve the risk profile of neuroendovascular procedures, increase the success rate of acute stroke intervention, and facilitate more effective secondary stroke prevention.

### **Intensive Care Unit Management of Interventional Neuroradiology Patients**

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E. Sander Connolly, Jr, Sean D. Lavine, Phillip M. Meyers, David Palistrandt, Augusto Parra, and Stephan A. Mayer

The management of interventional neurologic patients in the intensive care unit is based on their underlying disease for the most part. Patients with ischemic stroke are largely managed like patients with ischemic stroke who have not undergone interventional procedures, and the same is true for those with an aneurysmal subarachnoid hemorrhage or intracerebral hemorrhage secondary to an arteriovenous malformation, for example. Having said this, there are some special considerations that require special mention when it comes to managing patients after catheter-based procedures.

**Interventional Neuroradiology Adjuncts and Alternatives in Patients with Head and Neck Vascular Lesions**

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Michele H. Johnson, Veronica L. Chiang, and Douglas A. Ross

Vascular lesions of the head and neck can result from a variety of neoplastic and traumatic conditions that may cause local neurologic symptoms or may compromise the carotid or vertebral arteries, leading to ischemic deficits. Management of lesions involving vascular structures at the skull base may require a temporary balloon occlusion tolerance test or endovascular transarterial embolization as part of the preoperative management. Endovascular techniques can also be used as a salvage measure for severe head and neck bleeding and can assist with the management of vascular injury occurring in the operative or perioperative setting. Familiarity with the role of endovascular techniques in this group of patients may favorably influence patient management and outcome.

**Percutaneous Spinal Interventions**

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Arun Paul Amar, Donald W. Larsen, and George P. Teitelbaum

Interventional neuroradiology procedures of the spine are being performed with increasing frequency. These therapies complement and, in some cases, replace more conventional operations of the vertebral column and its contents. This article surveys the background, present application, and future horizons of several minimally invasive spinal interventions, including vertebroplasty and kyphoplasty, microcatheterization of the cervical epidural space via lumbar puncture for drug delivery, percutaneous intraspinal navigation, and percutaneous spinal fixation.

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