Treatment of Intracerebral Hemorrhage

Treatment of ICH is primarily supportive. Many patients require management in the intensive care setting to manage elevated blood pressure and secondary complications, such as respiratory failure, aspiration, and hemodynamic instability in severely neurologically compromised patients. In many cases, patients also require management of intracranial pressure using osmotic agents, such as mannitol or hypertonic saline, or therapeutic hyperventilation. In some patients, surgical evacuation of hematomas may be lifesaving, although trials have thus far failed to show that most ICH patients benefit from surgical decompression. Among more than 1000 participants randomized in a large international study, there was no evidence of benefit of surgical over medical therapy, apart from a potential benefit in the subgroup of patients with small superficial hemorrhages. Most hemorrhages that occur deep within the hemispheres probably cause the majority of their damage immediately after the ictal hemorrhage, so that evacuation does not save tissue and may introduce further damage.

One of the major recent insights into the pathogenesis of cerebral injury associated with ICH has been the recognition that a large proportion of hemorrhages continue to expand during the early hours after onset. As a result, there has been increased interest in the use of prothrombotic agents to reduce this expansion and to limit secondary cerebral injury. Though preliminary studies on the potential benefits of infusing factor VII as a prothrombogenic agent showed promise, subsequent and more definitive studies did not confirm a benefit in the majority of patients, although it remains possible that subgroups of patients, including those with warfarin-associated hemorrhage, may benefit.

For cerebellar hemorrhages, surgical decompression may be lifesaving, and it is essential to recognize the signs and symptoms of incipient brainstem compression and herniation (i.e., headache, vertigo, nausea, vomiting, and truncal ataxia without focal weakness, declining sensorium, and gaze-palsy). Neuroimaging studies that support the need for surgical decompression include hematoma greater than 3 cm, fourth ventricular shift, cisternal obliteration, and ventricular enlargement. Lumbar puncture is contraindicated with ICH, particularly with cerebellar hemorrhages because life-threatening tonsillar herniation and midbrain compression may occur. Great caution must be taken in these patients subjected to ventriculostomy for the purposes of reducing intracranial pressure because upward cerebellar herniation may occur.

The management of aneurysmal SAH is complicated. Recurrent bleeding risks and mortality are high; therefore, definitive therapy is elimination of the ruptured aneurysm. This may be accomplished surgically or with interventional embolization techniques, such as with coils deposited in the aneurysm. Even after securing the aneurysmal site of bleeding, however, several other complications may ensue, including vasospasm, cerebral infarction, cerebral edema, seizures, ventricular dilatation, the syndrome of inappropriate ADH secretion (SIADH), and cardiac failure. Antifibrinolytic agents, such as epsilon-amino-caproic acid, used to preserve the thrombus around an aneurysm, and thereby preventing rebleeding, have been unsuccessful. Transcranial Doppler screening may be used daily to detect early changes of vasospasm; continuous EEG monitoring and multimodality monitoring of vital signs are other emerging ways to detect cerebral dysfunction while still reversible. Vasospasm may be minimized with the calcium channel antagonist, nimodipine, which crosses the blood-brain barrier; use of nimodipine has become standard of care in SAH patients for up to 3 weeks after hemorrhage. Hydration, hyperosmolar therapy, hypertensive therapy, and angioplasty of vascular spasm may also be used to reduce risk of infarction. Hydrocephalus may require ventricular shunting.

Rehabilitation and Recovery

A team approach to stroke rehabilitation, starting with a stroke recovery unit with experienced physiatrists and physical therapists, has proven beneficial for the optimum recovery of patients. A specialized stroke unit is particularly helpful in avoiding complications such as infections, contractures, decubiti, and in maximizing independence for patients. Speech and occupational therapists help patients improve their swallowing, communication, and daily living skills.

Constraint-induced therapy is a specific type of physical therapy that involves having a hemiparetic patient wear a large mitt to prevent use of the unaffected limb for several hours daily, forcing the patient to use the affected limb for most tasks. In a randomized trial, constraint-induced therapy with intensive task-directed therapy was associated with functional improvement compared to standard physical therapy (Level B). Further studies are still needed to determine whether the use of constraints or the intensive nature of the therapy itself is responsible for the improvements in function since it is both intensive and expensive.

Depression is a frequent accompaniment of stroke, reflecting both the physical disability and altered brain chemistry. Depression may respond to selective serotonin-reuptake inhibitors (SSRIs) and tricyclic antidepressants. Escitalopram administered prophylactically to stroke patients was effective in preventing the development of depression, though other studies have not confirmed this (Level B). There is also evidence from other trials that SSRI treatment facilitates functional recovery after stroke.

Secondary Stroke Prevention

The optimal secondary prevention strategy for an individual patient depends on the stroke mechanism. For stroke or TIA caused by carotid stenosis of 70% or more of the vessel diameter, carotid endarterectomy (CEA) by a skilled surgeon with an acceptable complication rate (<5%) is preferable to medical therapy in good surgical candidates (Level A). For patients at high risk of surgical complications, including those over age 80, those with cardiac or pulmonary disease, or those with radiation-induced arteriopathy, stenting reduces the risks of cardiac complications (Level B). Trials that tested whether carotid angioplasty and stenting are more effective or safer than carotid endarterectomy in patients at low surgical risk have not demonstrated any benefit over open surgery (Level A). Among patients with symptomatic intracranial stenosis (lesions not amenable to surgery), a recent randomized trial demonstrated that best medical therapy,