Endovascular Revascularization of Symptomatic Acute Extracranial Internal Carotid Artery Occlusion

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See related article, pages 2426–2430.

A cut extracranial internal carotid artery (ICA) occlusion resulting in ischemic stroke is different from other forms of acute occlusion of the cerebral blood vessels. The occluded segment of the ICA consists of predominantly atherosclerotic plaque and a superimposed thrombus. The occluded segments in other cerebral blood vessels, such as the middle cerebral artery, usually consist of an occlusive embolus in a normal vessel. Therefore, the pathophysiologic processes involved in the occlusion of the extracranial ICA are similar to processes observed in acute occlusion of the coronary arteries. In acute myocardial infarction, primary stent placement has provided the best treatment outcomes. The present report provides early evidence to expand this approach to other occlusions, such as the ICA, where large contributions of atherosclerotic plaque and platelet activation do not provide an ideal substrate for thrombolytics alone.

There are 2 important factors that play a role in the technical success of the procedure. The channel with the fresh thrombus can provide a conduit for the wire and stent to traverse the lesion. Therefore, the lesion needs to be traversed before organization of the thrombus. This creates almost a time window for successful revascularization of the ICA occlusion. It should be noted that there is frequently an additional distal occlusion of the internal carotid artery, particularly in the supraclinoid segment, resulting from embolization or propagation of thrombus. This issue can limit the therapeutic value of the procedure despite achieving cervical ICA revascularization. Therefore, visualization to confirm patency of the distal vessel is essential before performing endovascular revascularization.

The clinical outcome of the revascularization procedure is also dependent on the viability and magnitude of the cerebral tissue at risk. This issue requires information regarding collateral supply to the affected hemisphere. In the setting of acute ischemic stroke, ICA occlusions are graded into 3 grades (Figure): (1) grade 5, ICA occlusion with no collateral flow to the affected hemisphere; (2) grade 4B, ICA occlusion with collateral flow filling the anterior cerebral artery of affected hemisphere; and (3) grade 4A, ICA occlusion with collateral flow filling the middle cerebral artery of affected hemisphere. Previous studies have demonstrated that best outcomes after revascularization are observed with grade 4A occlusions. Other methods, such as presence of mismatch on perfusion-diffusion MRI, may be valuable in selecting appropriate patients as used in the present report.

Additional research is required to determine the best adjuvant medical treatment for this procedure. There can be chronic changes in the autoregulatory capacity of the affected hemisphere because of long-standing hypoperfusion. Acute restoration of normal blood flow to the affected hemisphere using endovascular techniques can lead to hyperperfusion.

Figure 1. The patterns of occlusion observed in patients with acute ischemic stroke. Note that ICA occlusion (highlighted) constitutes the highest severity grades because of its association with poor outcome. ICA indicates internal carotid artery; MCA, middle cerebral artery; ACA, anterior cerebral artery; VA, vertebral artery; BA, basilar artery; LSA, lenticulostriate arteries; and LMC, leptomeningeal.
injury manifesting as cerebral edema and intracranial hemorrhages. This phenomenon has been described previously in patients with high-grade ICA stenosis undergoing carotid endarterectomy. Therefore, the use of thrombolytics, anticoagulants, and antiplatelet medication, which are necessary for acute recanalization and prevention of reocclusion, may have an increased risk. Despite these considerations, the present report provides the initial data required to pursue and optimize a new strategy for the treatment of patients with extracranial ICA occlusion and acute ischemic stroke.

References

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