Overview: carotid endarterectomy compared with angioplasty

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Few surgical procedures have been as exhaustively investigated as carotid endarterectomy (CEA). Over the last two decades, multiple prospective and retrospective clinical studies have been performed to evaluate the indications, techniques, and results of this operation. It is currently the preferred treatment in patients with hemodynamically significant ($> 70\%$ stenosis) clinically symptomatic carotid artery stenosis.[1,6,10] Furthermore, it has been established that CEA is superior to medical therapy in reducing the risk of stroke in male patients under 70 years of age in whom asymptomatic hemodynamically significant disease is present.[2]

More recently, the results of both anecdotal case reports and several prospective registration-type studies have demonstrated the potential efficacy and safety of carotid artery angioplasty as an alternative to CEA. In fact, based on these data, the National Institutes of Health has recently decided to support a prospective trial in which CEA is compared with carotid artery angioplasty with stenting in patients with symptomatic hemodynamically significant stenoses (CREST). Neurosurgeons, vascular surgeons, and endovascular interventionalists are now being recruited to participate in this clinical trial. Accordingly, this issue of Neurosurgical Focus is particularly timely because it contains papers summarizing techniques and clinical results from two expert interventionalist groups.

As discussed by Albuquerque and colleagues (Article 2 of this issue), CEA as performed by most surgeons today has exceedingly low perioperative complication rates. Most publications and discussions on carotid angioplasty compare endovascular results with those published in the NASCET study in which the two-year cumulative risk of major stroke was 2.5%, and for any stroke 9%. Contemporary surgical reports have clearly demonstrated results superior to that reported in the North American Symptomatic Carotid Endarterectomy Trial. The current complication rate of greater than 3% for major stroke and minor stroke, and death is considered unacceptable by most practicing surgeons. By comparison, the current published data on carotid angioplasty performed for both symptomatic and asymptomatic disease suggests that the combined major and minor stroke and death rate is between 5 and 9%.

A second issue which must be considered when comparing these two treatment modalities is the risk of recurrent carotid artery stenosis. In the surgical literature, this has also been an issue of great controversy because it brings to the forefront the debate over whether, after CEA, the arteriotomy should be closed primarily or with a patch graft. There is convincing data demonstrating that repair of the CEA with a patch graft significantly decreases the risk of recurrent stenosis.[3,8,9,11-15] The follow-up study in patients after carotid angioplasty is both short and also complicated by the fact that some studies have

used stent placement whereas others have not. However, analysis of the limited available data thus far indicate that after angioplasty has been performed the recurrent stenosis rate is between 5 and 22% within 1 year posttreatment.[5,16]

As noted by Dr. Lanzino and colleagues, surgery for recurrent carotid artery stenosis is technically more difficult and is associated with a higher perioperative surgical complication rate.[7] The data reported by this group regarding the treatment of recurrent carotid artery stenosis are quite encouraging and suggest that angioplasty may be a good alternative treatment especially in those patients who present early after CEA within 2 years; this suggests that the cause of the recurrent stenosis is myointimal hyperplasia. One of the great advantages of angioplasty in the setting of recurrent stenosis is that there is essentially no risk of injury to the lower cranial nerves. One of the more frequent complications that occurs after reoperation is injury to branches of the vagus nerve that can lead to postoperative dysphagia, which is often a major disability.

In summary, CEA is an excellent surgical procedure when performed by experienced surgeons. It significantly reduces the risk of stroke in patients with hemodynamically significant carotid artery stenoses. However, technological advances have greatly accelerated the feasibility of treating vascular lesions with less invasive endovascular techniques. Fortunately, because of its leadership, the neurosurgical community has been at the forefront of investigating new interventional technologies[4]. The final guidelines regarding the optimum treatment for carotid artery occlusive disease will be formulated based on data generated by prospective comparative clinical trials.

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