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VASCULAR DISEASE

# Carotid artery stenosis — stenting or endarterectomy?

Carotid artery stenting and carotid endarterectomy are used to treat patients with severe carotid stenosis to reduce the risk of stroke. Stenting, a less invasive procedure than endarterectomy, emerged as a potentially safer alternative to invasive surgery, but questions remain over the relative efficacy and safety of the two procedures. In this context, three new studies to compare carotid artery stenting with carotid endarterectomy — two large, randomized trials (CREST and ACT I) and a meta-analysis of four randomized clinical trials — show that, after the perioperative period, no significant difference in the rate of ipsilateral stroke exists between the two procedures.

In the CREST trial, which included 2,502 symptomatic and asymptomatic patients with severe carotid artery stenosis, the 10-year rate of ipsilateral stroke (excluding the periprocedural period) was 6.9% in the stenting group and 5.6% in the endarterectomy group (HR 0.99, 95% CI 0.64–1.52). In the ACT I trial, which included 1,453 asymptomatic patients with severe carotid artery stenosis at standard risk of surgical complications, the 5-year rate of ipsilateral stroke (excluding the periprocedural period) was 2.2% after stenting and 2.7% after endarterectomy. The meta-analysis by Howard and colleagues, which included data from a total of 4,754 patients from the EVA-3S, SPACE, and ICSS trials, and the 4-year follow-up findings from the CREST trial, showed that age had no effect on the postprocedural risk of stroke with either stenting or endarterectomy.

The results from CREST and ACT I suggest that "short-term and long-term outcomes with respect to the prevention of stroke are similar with stenting and endarterectomy," explain the ACT I trial investigators. However, both the CREST study and the meta-analysis showed significant differences between the two procedures during the perioperative period.

In the CREST trial, the investigators found no significant difference in the 10-year risk of the primary composite end point (stroke, myocardial infarction, or death during the periprocedural period, or ipsilateral stroke within 10 years) between the stenting and endarterectomy groups (HR 1.10, 95% CI 0.83–1.44), but more than half of the ipsilateral strokes during the 10-year follow-up in the stenting group occurred within the first month, and the risk of periprocedural stroke or death was higher than in the endarterectomy group (HR 1.37, 95% CI 1.01–1.86, $P = 0.04$). "Emphasis should be given to reducing periprocedural risk with both stenting and endarterectomy," advise the CREST trial investigators.

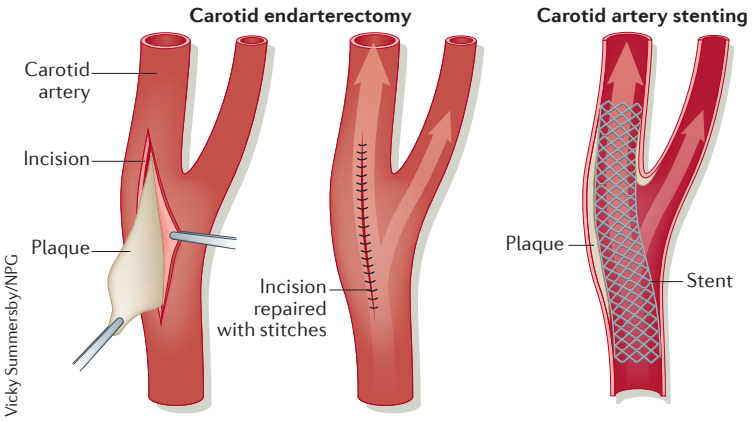
> "short-term and long-term outcomes with respect to the prevention of stroke are similar with stenting and endarterectomy"

In line with these findings, Howard *et al.* found that, in patients treated with stenting, the periprocedural risk of stroke increased with age. In patients aged ≥70 years, the risk of periprocedural stroke or death was fourfold greater than in patients aged <60 years, and was significantly higher than in patients treated with endarterectomy.

In contrast, the ACT I trial shows that, in asymptomatic patients, stenting was noninferior to endarterectomy with respect to the primary composite end point of periprocedural stroke, myocardial infarction, or death, or ipsilateral stroke within 1 year (3.8% versus 3.4%; $P = 0.01$ for noninferiority).

"The long-term results of CREST may help [to] guide the treatment of patients with carotid artery disease," conclude the CREST trial investigators. However, a limitation of the three studies is that none included a group treated with contemporary medical therapy. Hopefully, the ongoing CREST 2 trial, which includes a medical group, will help to assess the benefits of revascularization compared with optimal medical therapies.

*Irene Fernández-Ruiz*

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**ORIGINAL ARTICLES** Brott, T. G. *et al.* Long-term results of stenting versus endarterectomy for carotid-artery stenosis. *N. Engl. J. Med.* http://dx.doi.org/10.1056/NEJMoa1505215 | Rosenfield, K. *et al.* Randomized trial of stent versus surgery for asymptomatic carotid stenosis. *N. Engl. J. Med.* http://dx.doi.org/10.1056/NEJMoa1515706 | Howard, G. *et al.* Association between age and risk of stroke or death from carotid endarterectomy and carotid stenting: a meta-analysis of pooled patient data from four randomised trials. *Lancet* http://dx.doi.org/10.1016/S0140-6736(15)01309-4