

Carotid Artery Stenting Versus Endarterectomy for Treatment of Carotid Artery Stenosis

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Atherosclerotic stenosis of the internal carotid artery is an important cause of stroke. Carotid artery stenting (CAS) is an alternative to carotid endarterectomy (CEA) for the treatment of carotid stenosis. This review updates a previous version last published in 2012 including all randomized clinical trials comparing CAS to CEA for treatment of carotid stenosis.

OBJECTIVES

To compare the benefits and risks of CAS and CEA in patients with symptomatic or asymptomatic carotid stenosis.

METHODS

We searched the Cochrane Stroke Group Trials Register and the following databases: CENTRAL (Cochrane Central Register of Controlled Trials), MEDLINE (Medical Literature Analysis and Retrieval System Online), Embase, and Science Citation Index (all last searched August 2018). We also searched ongoing trials registers, reference lists, and contacted researchers in the field. All randomized clinical trials comparing CAS with CEA for symptomatic or asymptomatic atherosclerotic carotid stenosis were included.

One review author selected trials for inclusion, assessed trial quality and risk of bias, and extracted data by using Cochrane and GRADE (Grading of Recommendations Assessment, Development and Evaluation Working Group) methodology. A second review author independently validated trial selection and a third review author independently validated data extraction. We calculated treatment effects as odds ratios (OR) and 95% CI, with CEA as the reference group. We quantified heterogeneity using the I^2 statistic.

MAIN RESULTS

Twenty-two trials involving 9753 participants were available to assess the overall certainty of the evidence. We categorized our findings on symptomatic carotid stenosis as high-certainty evidence and on asymptomatic carotid stenosis as medium-certainty evidence.

In symptomatic carotid stenosis, CAS was associated with a higher risk of death or stroke within 30 days of treatment (periprocedural period; OR, 1.70 [95% CI, 1.31–2.19]; $P < 0.0001$, $I^2 = 5\%$; 10 trials, 5396 participants) compared with CEA. Rates of periprocedural death or stroke did not differ significantly in people < 70 years (prespecified subgroup analysis; OR, 1.11 [95% CI, 0.74–1.64]) but were significantly increased with CAS compared with CEA in patients ≥ 70 years (OR, 2.23 [95% CI, 1.61–3.08], interaction $P = 0.007$). CAS was associated with lower risks of myocardial infarction (OR, 0.47 [95% CI, 0.24–0.94]; $P = 0.03$, $I^2 = 0\%$), cranial nerve palsy (OR, 0.09 [95% CI, 0.06–0.16]; $P < 0.00001$, $I^2 = 0\%$), and access site hematoma (OR, 0.32 [95% CI, 0.15–0.68]; $P = 0.003$, $I^2 = 27\%$) than CEA.

CAS was associated with a significantly higher risk of the combination of periprocedural death or stroke or ipsilateral stroke during follow-up compared with CEA (OR, 1.51 [95% CI, 1.24–1.85]; $P < 0.0001$, $I^2 = 0\%$; 8 trials, 5080 participants; Figure). However, the rate of ipsilateral stroke beyond 30 days after treatment alone did not differ between treatments (OR, 1.05 [95% CI, 0.75–1.47]; $P = 0.77$, $I^2 = 0\%$).

Key Words: carotid stenosis ■ endarterectomy, carotid ■ myocardial infarction ■ odds ratio ■ risk ■ stenting ■ stroke

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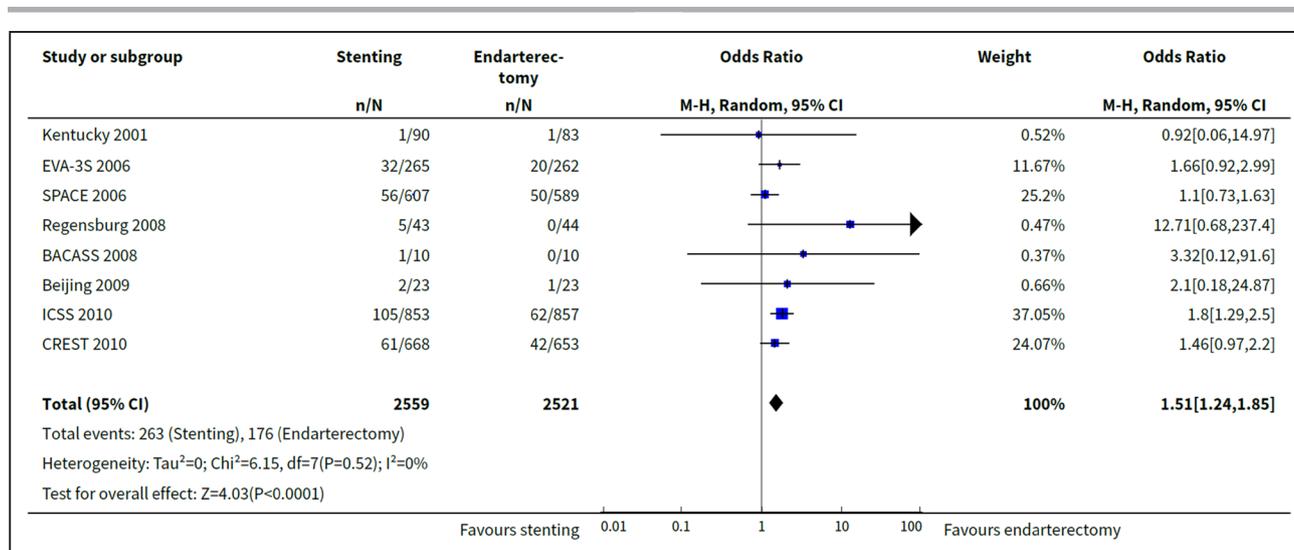


Figure. The combination of death or any stroke occurring between randomization and 30 d after treatment or ipsilateral stroke until the end of follow-up could be extracted from 8 trials.

Six trials²⁻⁹ provided data on extensive follow-up periods of 4 years or longer. The primary combined outcome occurred significantly more often among participants randomized to stenting than among those allocated to endarterectomy.

Among patients with asymptomatic carotid stenosis, there was a non-significant increase in periprocedural death or stroke with CAS compared with CEA (OR, 1.72 [95% CI, 1.00–2.97]; $P=0.05$, $I^2=0\%$; 7 trials, 3378 participants). The risk of periprocedural death or stroke or ipsilateral stroke during follow-up did not differ significantly between treatments (OR, 1.27 [95% CI, 0.87–1.84]; $P=0.22$, $I^2=0\%$; 6 trials, 3315 participants).

Moderate or higher carotid artery restenosis ($\geq 50\%$) during follow-up was more common after CAS (OR, 2.00 [95% CI, 1.12–3.60]; $P=0.02$, $I^2=44\%$), but the difference in risk of severe restenosis was not significant ($\geq 70\%$; OR, 1.26 [95% CI, 0.79–2.00]; $P=0.33$, $I^2=58\%$).

CONCLUSIONS

In patients with symptomatic carotid stenosis, CAS is associated with a higher risk of stroke or death within 30 days of treatment than CEA. This extra risk is mostly attributed to an increase in periprocedural stroke occurring in patients ≥ 70 years. Beyond 30 days after treatment, CAS is as effective in preventing recurrent stroke as CEA. However, combining procedural safety and long-term efficacy in preventing recurrent stroke, CAS is still associated with higher risks than CEA.

In people with asymptomatic carotid stenosis, there may be a small increase in the risk of stroke or death within 30 days of treatment with CAS compared with CEA.

IMPLICATIONS FOR PRACTICE AND FUTURE RESEARCH

CAS can be safely offered as an alternative to CEA in patients with symptomatic carotid stenosis < 70 years, provided both treatments are technically feasible. Older patients should be treated with CEA. In patients with asymptomatic carotid stenosis, the amount of evidence currently available is limited and further data from randomized trials are needed.

ARTICLE INFORMATION

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