

Carotid Endarterectomy

The most common surgical intervention for [carotid artery stenosis](#) is carotid [endarterectomy](#) (CEA). Many studies on CEA have been reported and suggested medical indications. For symptomatic [carotid artery stenosis](#), generally, CEA may be indicated for patients with more than 50% stenosis and is especially beneficial in men, patients aged 75 years or older, and patients who underwent surgery within 2 weeks of their last symptoms. For [asymptomatic carotid artery stenosis](#), CEA may be indicated for those with more than 60% stenosis, though each guideline has different suggestions in detail. In order to evaluate the indication for CEA in each case, it is important to assess risks for CEA carefully including anatomical factors and comorbidities and to elaborate each strategy for each operation based on preoperative imaging studies including carotid [ultrasonography](#), [magnetic resonance imaging](#), and [angiography](#). In surgery, there are many tips on operative position, procedure, shunt usage, and monitoring to perform a safe and smooth operation. Now that [carotid artery stenting](#) has been rapidly developed, a better understanding of CEA is required to treat [carotid artery stenosis](#) adequately. ¹⁾

[Carotid artery endarterectomy](#) is widely used on the carotid artery of the neck as a way to reduce the risk of [stroke](#), particularly when the carotid artery is narrowed by more than 70%. A [carotid endarterectomy](#) may itself cause a [stroke](#) at the time of [operation](#).

Endarterectomy is also used as a supplement to a vein bypass graft to open up distal segments.

Pulmonary hypertension caused by chronic thromboembolic disease (CTEPH) may be amenable to pulmonary thromboendarterectomy of the pulmonary artery. This is a highly specialized procedure.

[Carotid artery stenosis](#) (CS) is a major cause of [ischemic stroke](#). Treatment of CS consists of best medical treatment and carotid revascularization (CR), including carotid endarterectomy (CEA) and [carotid artery stenting](#) (CAS). Both CR techniques have their own procedural risks. Therefore, selection of the appropriate treatment for patients with CS is relatively complicated. Many studies and guidelines have reported the efficacy of each treatment for both symptomatic and asymptomatic patients. However, the results are still controversial, especially concerning the efficacy and safety of CEA and CAS ²⁾.

Carotid [endarterectomy](#) is a surgical procedure to remove the atheromatous plaque material, or blockage, in the lining of an artery constricted by the buildup of soft/hardening deposits. It is carried out by separating the plaque from the arterial wall.

Atherosclerotic stenosis of the internal carotid artery causes 10–15% of all strokes. Carotid endarterectomy lowers the long-term risk of stroke in patients with symptomatic carotid artery stenosis ^{3) 4)}.

Carotid endarterectomy (CEA) is a common, well-developed surgical procedure.

Technique: Carotid endarterectomy is safe, effective, and durable, but can we make it better? ⁵⁾.

Indications

[Carotid artery endarterectomy indications.](#)

Pre-op risk factors for CEA

Identifying patients at high risk for complications after CEA has proven challenging. Typically, the exclusion criteria from studies are cited, but in most cases, these are simply patients that were not included in the study because it was the investigators' perception that these patients might be "high risk." Therefore these risk factors are not validated. They are included here for completeness. NASCET and ACAS: age > 80 years, prior ipsilateral CEA, prior contralateral CEA within 4 months, prior neck XRT, tandem lesion larger than target lesion, other conditions that could cause symptoms (atrial fibrillation, prior stroke with persistent major deficit, valvular heart disease), major organ failure, uncontrolled hypertension or diabetes mellitus, and significant coronary artery disease ^{6) 7)}

The SAPHIRE Trial (Stenting and Angioplasty with Protection in Patients at High-Risk for Endarterectomy): patients with clinically significant cardiac disease (CHF, abnormal stress test, or need for open-heart surgery), severe pulmonary disease, contralateral carotid occlusion, contralateral laryngeal-nerve palsy, previous radical neck surgery or neck XRT, recurrent stenosis after endarterectomy, and age > 80 years ⁸⁾.

The ARChER Trial (ACCULINK for Revascularization of Carotids in High-Risk patients) also included patients with tracheostomy, spinal immobility, and dialysis-dependant renal failure ⁹⁾.

Operative technique

[Carotid Endarterectomy operative technique](#)

Post-op check

In addition to routine, the following should be checked:

1. change in neurologic status due to cerebral dysfunction, including:
 - a) pronator drift(R/O new hemiparesis)
 - b) signs of dysphasia (especially for left-sided surgery)
 - c) mimetic muscle symmetry (assesses facial nerve function)
2. pupil diameter and reaction (R/O stroke, Horner syndrome)
3. severe H/A (especially unilateral) > may indicate hyperperfusion syndrome
4. STA pulses (R/O external carotid occlusion)

5. tongue deviation (R/O [hypoglossal nerve injury](#))
6. symmetry of lips (R/O weakness of lower lip depressors due to retraction of marginal mandibular branch of the facial nerve against mandible usually resolves in 6–12 wks, must differentiate from central VII palsy due to stroke)
7. check for hoarseness (R/O recurrent laryngeal nerve injury)
8. assess for a hematoma in operative site: note any tracheal deviation, dysphagia

Simulation

A bovine placenta training model for CEA is inexpensive and readily available and closely resembles human carotid arteries. The model can provide a convenient and valuable simulation and practice addition for vascular surgery training ¹⁰⁾.

Workup

[Neurocognitive](#) performance is used to assess multiple [cognitive function](#), including [motor coordination](#), before and after carotid endarterectomy (CEA).

Complications

[Carotid artery endarterectomy complications](#).

Bibliometrics

Citation analysis on [carotid endarterectomy](#) has witnessed a marked shift in the [publication](#) trends from studying the [outcome](#) and [complications](#) to comparing [carotid artery stenting](#) with [endarterectomy](#). This analysis is a good introductory article to physicians interested in this topic, as it summarizes the highly impactful [articles](#) and enlists the most-cited RCT on CEA ¹¹⁾.

Case series

[Carotid artery endarterectomy case series](#)

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