



## Best Evidence Topic

## Stroke incidence between stenting and endarterectomy for asymptomatic carotid artery stenosis



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## ABSTRACT

A best evidence topic has been constructed using a described protocol. The three-part question addressed was: In patients with significant asymptomatic carotid artery stenosis (ACAS), Does Carotid artery stenting (CAS) has a peri-procedural lower Stroke rate, As compared to Carotid endarterectomy (CEA)? The outcomes assessed were the stroke rate in the two management modalities. The best evidence showed no statistically significant difference between CAS and CEA regarding the peri-procedural and the long-term non-procedural stroke incidence. However, in high-risk patients, CAS may be a better option.

## 1. Introduction

This BET was designed using a framework outlined by the International Journal of Surgery [1]. This format was used because a preliminary literature search suggested that the available evidence is insufficient to perform a meaningful meta-analysis. A BET provides evidence-based answers to common clinical questions using a systematic approach of reviewing the literature (see Table 1).

## 2. Clinical scenario

While consenting a 67-year-old man with significant asymptomatic carotid artery stenosis (60–69% NASCET criteria) for carotid endarterectomy (CEA), one of the junior doctors asked; which modality of management has long term lower stroke rates; CEA or CAS?

## 3. Three parts question

- [In patients with significant asymptomatic carotid artery stenosis,]
- [Which modality of treatment has lower stroke rate];
- [CAS or CEA]?

## 4. Search strategy

1. Embase 1974 to June 2021 using the OVID interface:

[Asymptomatic carotid artery stenosis]AND [Carotid artery stenting OR CAS] AND [Carotid endarterectomy OR CEA] AND [Stroke]

2. Medline using the PubMed interface:

[Asymptomatic carotid artery stenosis]AND [Carotid artery stenting OR CAS] AND [Carotid endarterectomy OR CEA] AND [Stroke]  
The results were limited to English articles and human studies.

- **Inclusion criteria:** all original articles that review the stroke rate among patients with severe asymptomatic carotid artery stenosis who underwent CEA vs CAS.
- **Exclusion criteria:** case reports, letters to the editor, conference abstracts and systematic reviews and meta-analysis.

## 5. Search outcome

A total of 794 papers were found using both search engines. We excluded seven hundred sixty two essays because they were irrelevant

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**Table 1**  
Summary of search results.

Author/date of publication/journal/country	Study type and level of evidence	Patient group	Outcomes follow up	Key results	Additional comments
Halliday A et al., 2021, Lancet, UK [2].	Randomized control trial- Level 1b	Total of 3625 patients. * Group 1 CAS: 1811 patients *Group 2 CEA: 1814 patients. * Mean Follow-up, 5 years.	*End point is: 1. Cumulative peri-procedural morbidity (CVA,MI) and mortality 2. Non-Procedural stroke (5-years)	<b>Peri-Procedural stroke</b> *Group 1 CAS: 3.6% (61) patients. *Group 2 CEA: 2.4% (41) patients. *P value = 0.06 *Statistically Insignificant <b>Non-Procedural stroke</b> *Group 1 CAS: 5.2% (91) patients. *Group 2 CEA: 4.5% (79) patients. *P value = 0.33 *Statistically Insignificant	*Long term. *Multi Center.
Reiff T et al., 2018, International Journal of stroke, Germany [3].	Randomized control trial- Level 1b	*Total of 513 patients. *Group 1 CAS: 203 patients *Group 2 CEA: 197 patients *Follow up was 1 year.	*End point is: 1. Cumulative peri-procedural morbidity (CVA,MI) and mortality 2. Non-Procedural stroke	<b>Peri-Procedural stroke</b> Group 1 CAS: 2.5% (5) Group 2 CEA: 2.5% (5) *P value = 0.24. *Statistically Insignificant <b>Non-Procedural stroke</b> *Group 1 CAS: 4.1% (8) patients. *Group 2 CEA: 3.9% (8) patients. *P value = 0.25 *Statistically Insignificant	* Short term *Small sample size *Multi Centre *Included 3rd group; best medical treatment (BMT:113) *Routine cerebral MRI was not part of the study.
Mannheim D et al., 2017, J Cardiovasc Surg, Israel [4]	Randomized trial -level II	*Total of 136 patients. *Group 1 CAS: 68 patients *Group 2 CEA: 68 patients. *Mean Follow up was 26 Months.	* End point is: 1. Cumulative Peri-procedural morbidity (CVA,MI) and mortality 2. Non-Procedural stroke (5-years) and recurrent stenosis	<b>Peri-Procedural stroke</b> Group 1 CAS: 2.9% (2) Group 2 CEA: 1.5% (1) *P value = NS. <b>Non-Procedural stroke</b> *Group 1 CAS: 1.5% (1) patients. *Group 2 CEA: 0% (0) patients. *P value = NS	* Long term. *Small sample size *Single center
Rosenfield K et al., 2016, NEJM, UK [5].	Randomized control trial- Level 1b	*Total of 1453 patients. *Group 1 CAS: 1089 patients *Group 2 CEA: 364 patients. *Mean Follow-up 5 years;	*End point is: 1. Cumulative Peri-procedural morbidity (CVA,MI) and mortality 2. Non-Procedural Ipsilateral stroke(5-years)	<b>Cumulative Peri-Procedural stroke or death</b> Group 1 CAS: 2.8% (30) Group 2 CEA: 1.4% (5) *P value = 0.23. *Statistically Insignificant <b>Freedom from Non-Procedural stroke</b> *Group 1 CAS: 97.8%. *Group 2 CEA: 97.3%. *P value = 0.51 *Statistically Insignificant	*Large sample size. *Multi center *Embollic protection device is used. *Patient age ≤79. *Lack of proper medical therapy *Inclusion of the peri procedural MI in the primary composite endpoint
Brott T G et al., 2016, N Engl J Med, UK [6].	Randomized control trial- Level 1b	*Total of 1181 patients *Group 1 CAS: NA *Group 2 CEA: NA *Follow up is 10 years	End point: 1. Composite Peri-operative morbidity (CVA,MI) and mortality 2. Non-Procedural Ipsilateral stroke (10 year).	<b>Peri-Procedural stroke</b> *Group 1 CAS: 2.5% (15) patients *Group 2 CEA: 1.4% (8) patients *P value = 0.15. *Statistically Insignificant <b>Non-Procedural stroke(4-years)</b> *Group 1 CAS: 4.5% (24) patients. *Group 2 CEA: 2.7% (13) patients. *P value = 0.07 *Statistically Insignificant	*The post-procedural ipsilateral strokes were similar at 5 and 10 years in both groups.
Yadav J S et al., 2004, N Engl J Med, UK [7].	Randomized control trial- Level 1b	*Total of 237 patients with severe asymptomatic carotid stenosis * Group 1 CAS: NA *Group 2 CEA: NA *Follow up is 3 years	* End point: 1. Cumulative Peri-operative morbidity (CVA,MI) and mortality 2. Ipsilateral stroke (1 year).	*Statistically Insignificant <b>Cumulative Peri-procedural (stroke/death/MI)</b> Group 1 CAS: 5.4% Group 2 CEA: 10.2% *P Value = 0.20 *Statistically Insignificant <b>Non-Procedural cumulative outcome (1-</b>	*Small sample size *Multi center *Heterogeneous patient population (Symptomatic and asymptomatic) *Asymptomatic patients ≥80 stenosis. *Different endpoints

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Table 1 (continued)

Author/date of publication/journal/country	Study type and level of evidence	Patient group	Outcomes follow up	Key results	Additional comments
				year): Group 1 CAS: 9.9% Group 2 CEA: 21.5% *P Value = 0.02. *Statistically Significant	*Variety of endovascular devices used

based on the titles and or the abstracts. Thirty-two full-text articles were screened and assessed for eligibility. From these, we identified six papers to provide the best evidence to answer the question.

## 6. Result

## 7. Discussion

Asymptomatic Significant carotid artery stenosis (ACAS>50%) remains a global problem (2.2%–5.2%) due to the unignorable risk of cerebrovascular events, disability, and death. ACAS is diagnosed in individuals without a history of ipsilateral ischemic stroke or TIA and without presenting focal neurological symptoms in the last six months [8].

Despite advances in the medical management of ACAS, patients may require invasive treatment, either surgical CEA or endovascular CAS. Based on several randomized clinical trials, current guidelines recommend prophylactic CEA in patients with >70% stenosis. Given the risk of peri-operative stroke, MI, and death, CAS has been proposed as an alternative to CEA [9].

Unfortunately, Most of the trials carried out comparing CAS with CEA have produced unreliable results because of using different endpoints, different endovascular devices, variable experiences of the interventional radiologists and heterogeneous patient populations [10].

In this article, we have reviewed the best studies which compared the CEA to the CAS, considering the peri-procedural (0–30 days) and non-procedural (31 days-end of follow-up) stroke incidence.

All of the studies included were randomized controlled trials [2–7]. Three of the studies had a large sample size of more than 1000 patients [2,5,6]. All studies in our review demonstrated that the peri-procedural stroke incidence in both study groups was not statistically significant. There was no significant difference in non-procedural stroke either, the exception being the SAPHIRE study that reported that CAS has a statistically significant lower non-procedural composite incidence of MI, stroke, and TIA than CEA [7]. This is likely to be explained by the fact that the SAPHIRE Population had more significant co-morbidities (75.5% of patients undergoing CEA had coronary artery disease), leading to a significantly higher rate of MI in the CEA compared to the CAS group ( $p = 0.03$ ) [8].

## 8. Clinical bottom line

According to the above articles, the best evidence shows no statistically significant difference in the peri-procedural and the long-term non-procedural stroke incidence among carotid artery stenting and carotid endarterectomy in asymptomatic carotid artery stenosis. However, in high-risk patients, carotid artery stenting may be a better option.

### Ethical approval

Ethical approval was not required.

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None.

### Author contribution

Ahmed Abdel Rahim (AA): Conducted the literature search and wrote the paper. Mahmoud Ahmed Thabet (MT): Assisted in the literature search and Writing of paper. Ali Mahmoud Galal (AG): Editing of writing. Mohamed Ibrahim Abd-El Rahman Hammouda (MH): Assisted in writing of paper. Devender Mittapalli (DM): Assisted in the literature search and writing of paper.

### Guarantor

Ahmed Abdel Rahim.

### Consent

Ethics committee approval was not required as the study was review of previously done studies.

### Declaration of competing interest

No conflicts of interest.

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