

# Carotid Artery Stenting

## Can carotid stenting before CABG reduce perioperative stroke?

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# Carotid Stenosis in Patients Undergoing CABG

- The reported incidence of carotid disease in patients undergoing CABG has varied from 2 to 22%, average of 8%.
- This wide variation in the reported incidence is related to the population based studies.

*Bull DA, Cardiovasc Surg 1993;1:182*

*Ivey TD, J Thorac Cardiovasc Surg 1984;87:183*

*Schwartz LB, J Vasc Surg 1995;21:146*

*Loop FD, Ann Thorac Surg 1988;45:591*

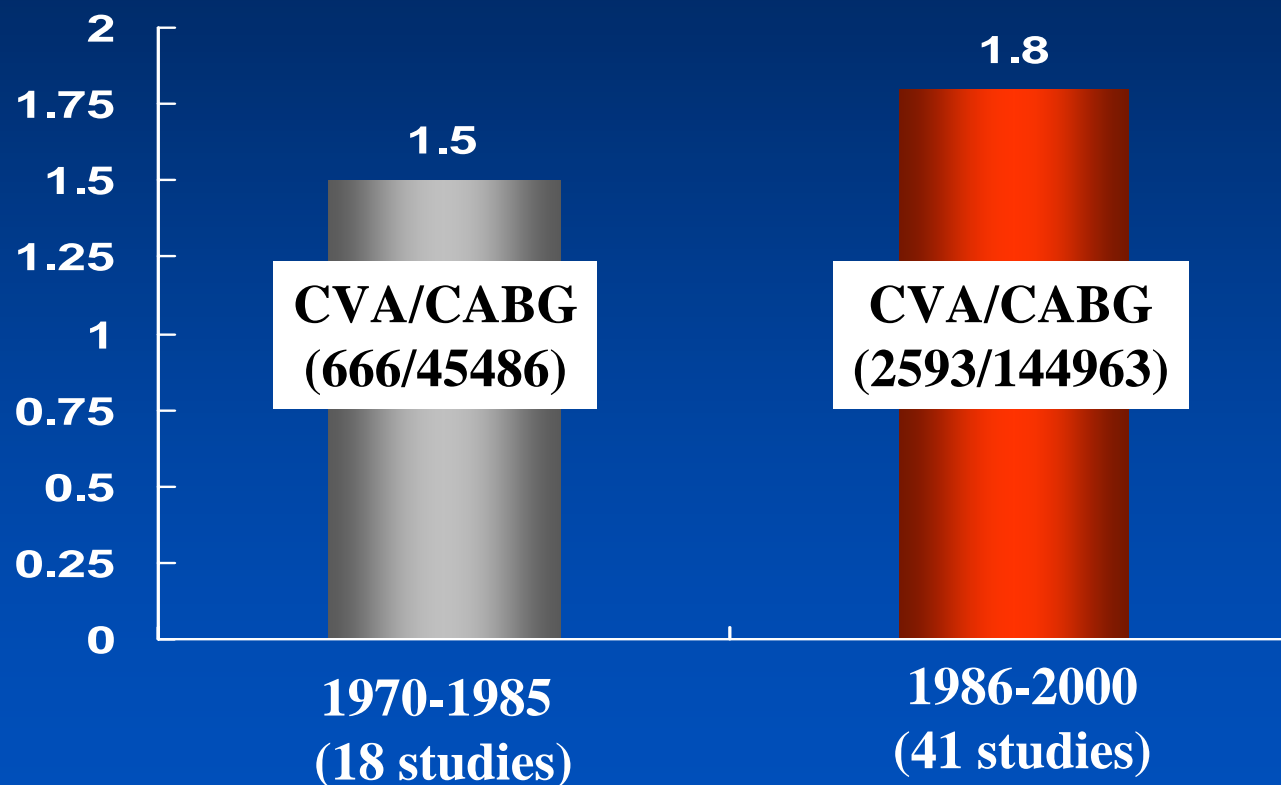
# Risk Factors for Post-CABG Stroke

- Aortic arch disease
- Prolonged cardiopulmonary bypass
- **Carotid artery disease**
- Diabetes
- Smoking
- Pulmonary disease
- Ventricular thrombus
- Left main disease

*Durand DJ, Ann Thorac Surg 2004;78:159*

# Risk of Stroke During CABG

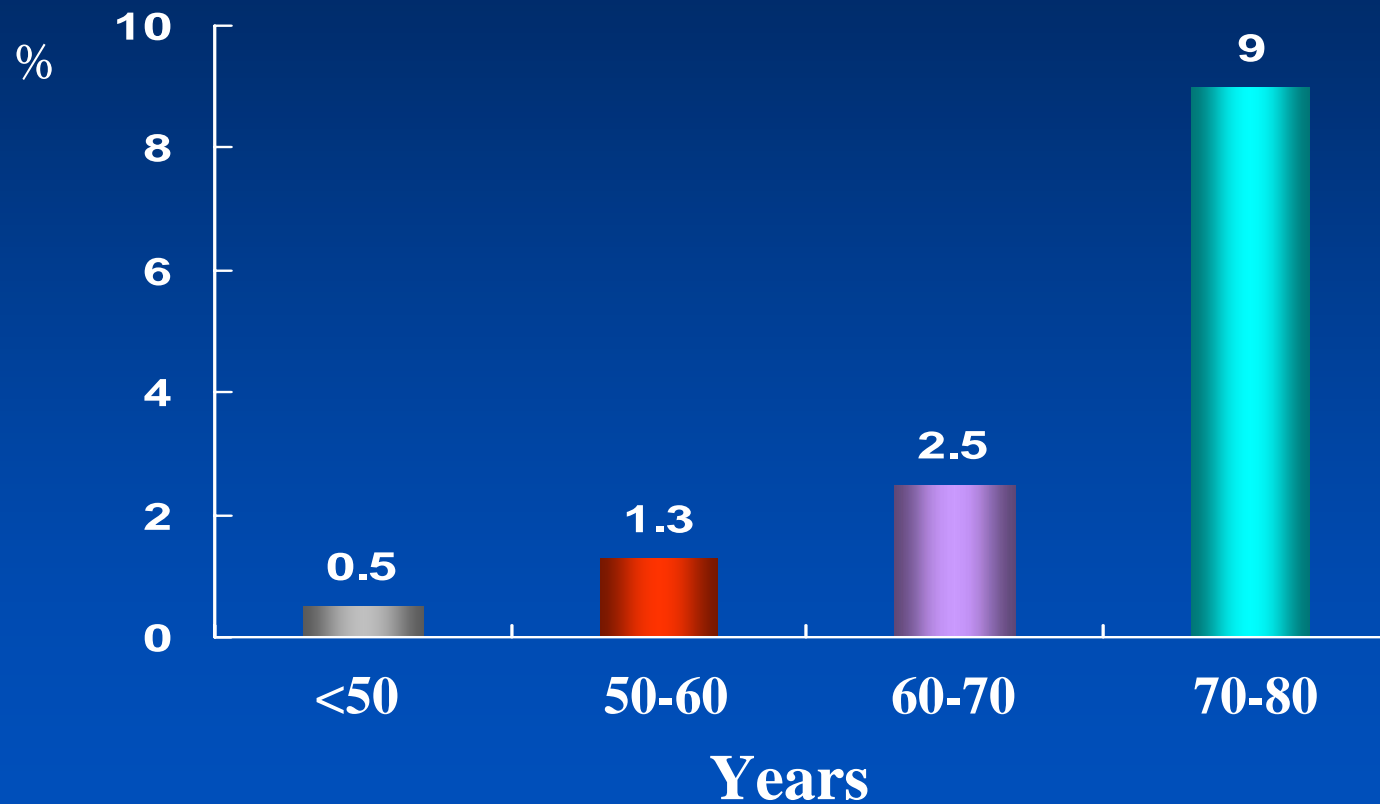
## Effect of Time



*Naylor AR, Eur J Vasc Endovasc Surg 2002;23:283-294*

# Risk of Stroke During CABG

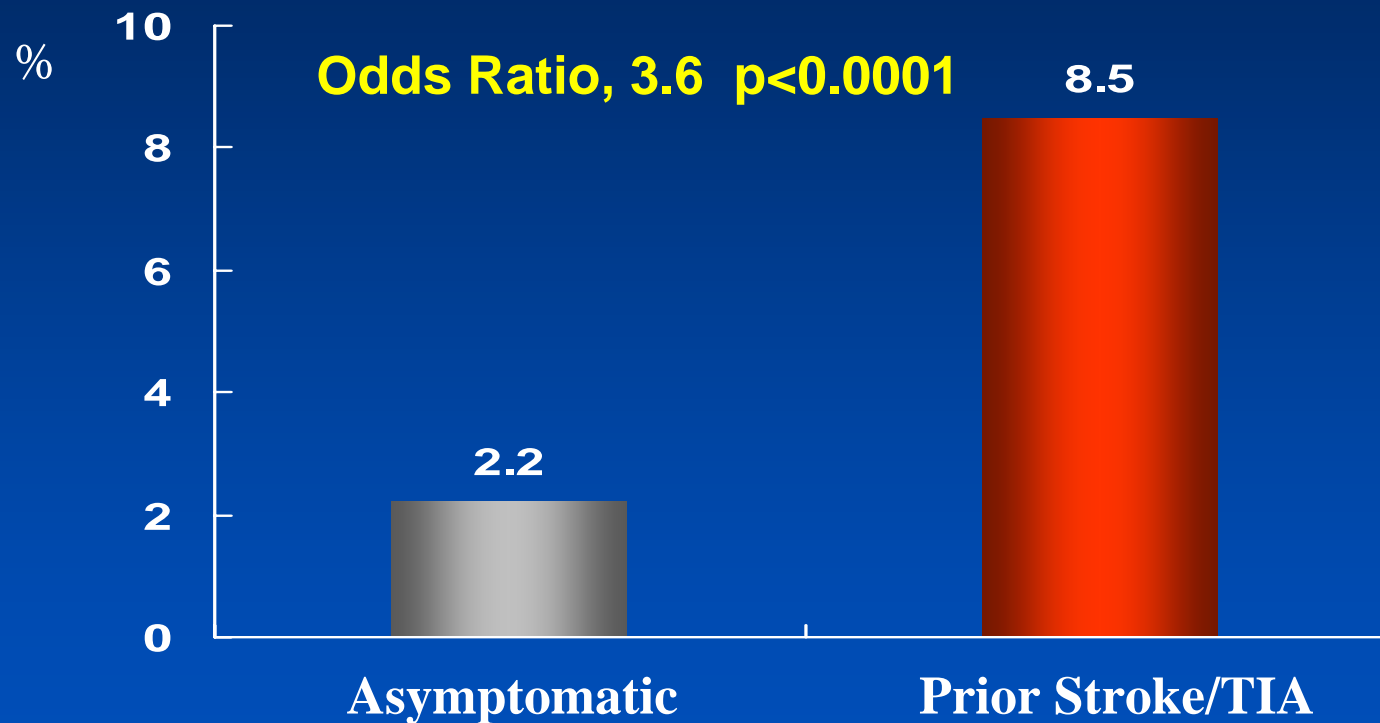
## Effect of Age



*Naylor AR, Eur J Vasc Endovasc Surg 2002;23:283-294*

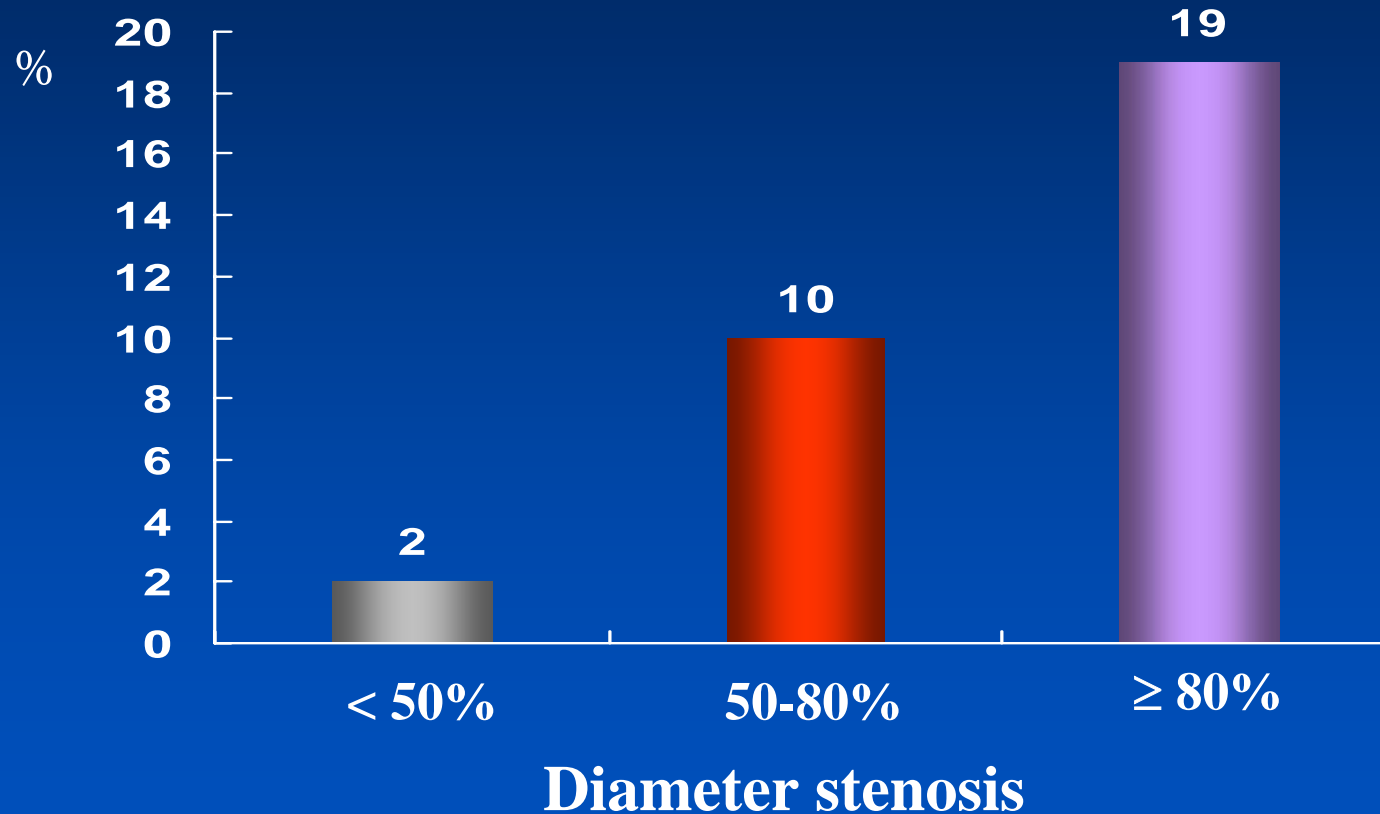
# Risk of Stroke During CABG

## Neurological Status



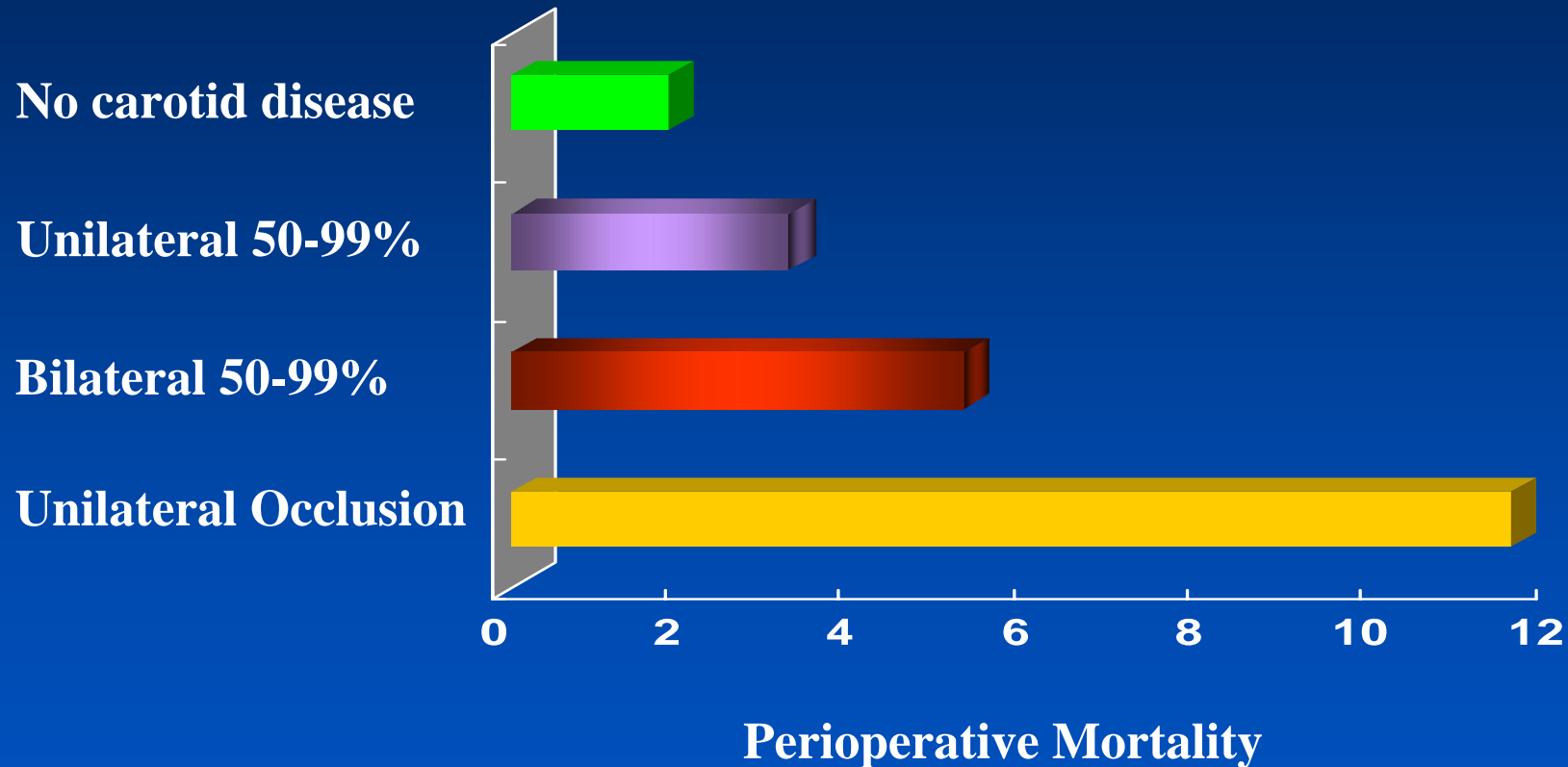
*Naylor AR, Eur J Vasc Endovasc Surg 2002;23:283-294*

# Perioperative stroke after CABG



*Naylor AR, Eur J Vasc Endovasc Surg 2002;23:283-294*

# Risk of Stroke During CABG



*Naylor AR, Eur J Vasc Endovasc Surg 2002;23:283-294*



## **Great Debates**

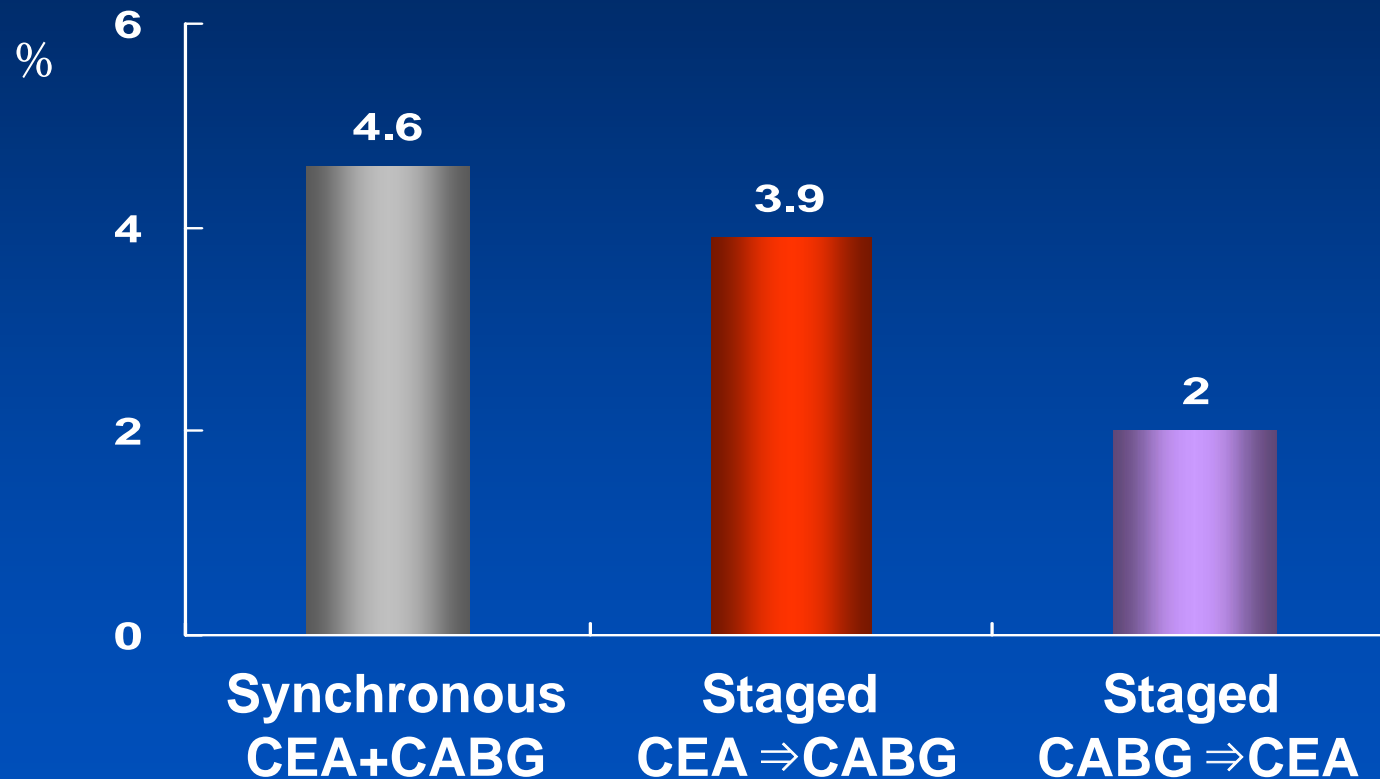
# **Carotid Endarterectomy vs. Conservative Treatment in Asymptomatic Carotid Artery Disease Before CABG**

**How do we treat  
carotid artery disease?**

**Various Treatment Modalities**

# Operative Mortality According to Treatment Modalities

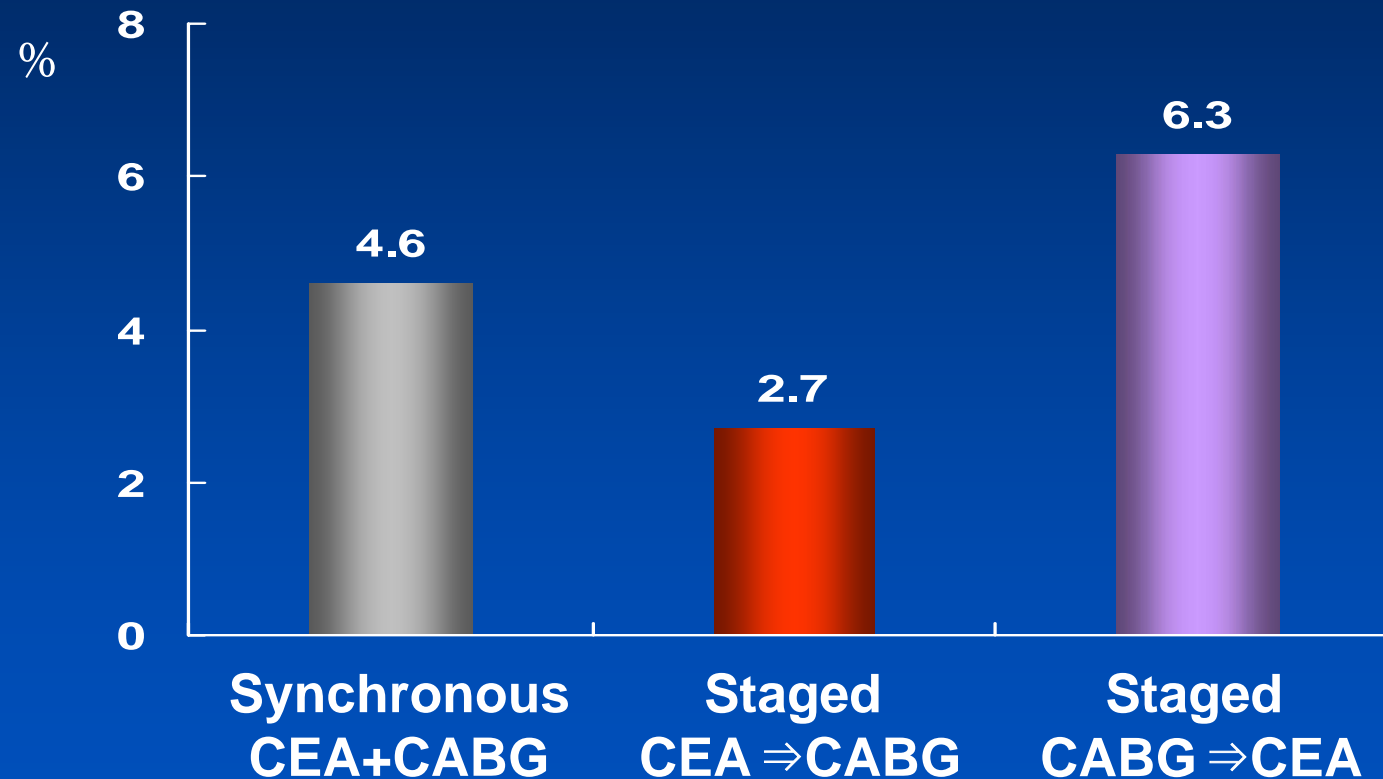
Meta-analysis of 97 Studies (8972 patients)



*Naylor AR, Eur J Vasc Endovasc Surg 2003;25:380-389*

# Any Stroke According to Treatment Modalities

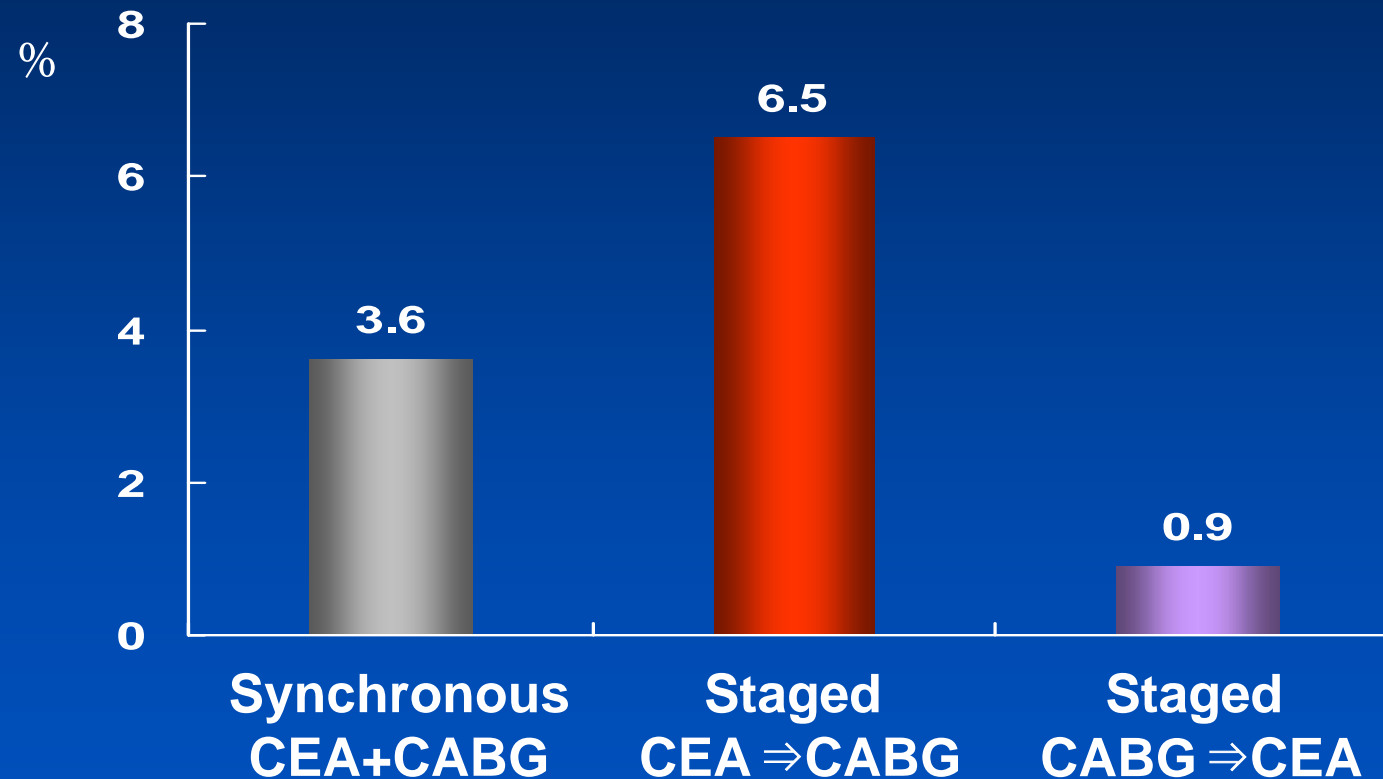
Meta-analysis of 97 Studies (8972 patients)



*Naylor AR, Eur J Vasc Endovasc Surg 2003;25:380-389*

# AMI According to Treatment Modalities

Meta-analysis of 97 Studies (8972 patients)



*Naylor AR, Eur J Vasc Endovasc Surg 2003;25:380-389*

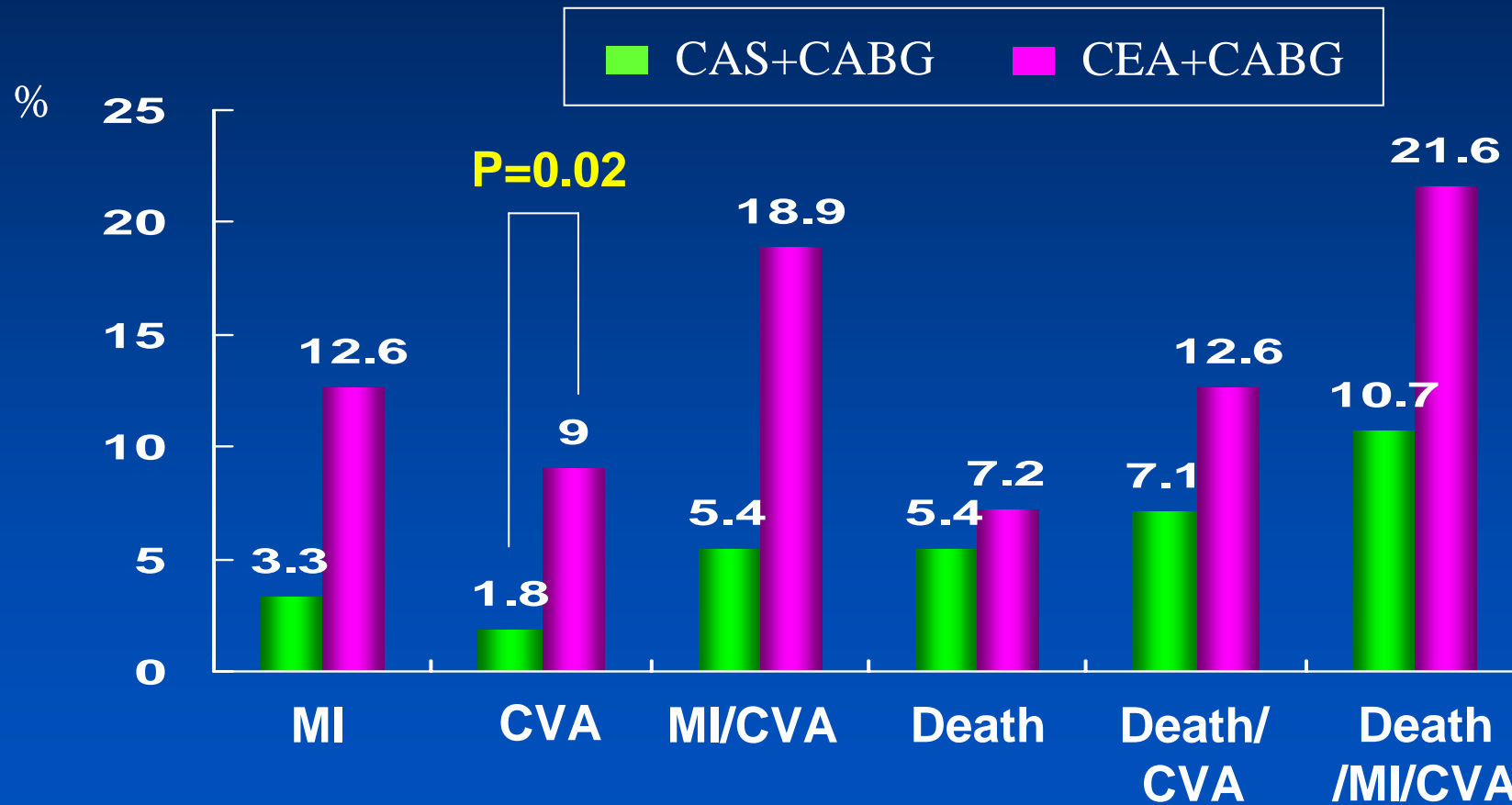
# Current (2004) ACC/AHA Guideline

- CEA is probably recommended before CABG or concomitant to CABG in patients with a symptomatic or asymptomatic patients with unilateral or bilateral internal carotid stenosis of 80% or more.
- Class IIa, level of evidence C

*Eagle K et al, Circulation 2004;110:1168-1176*

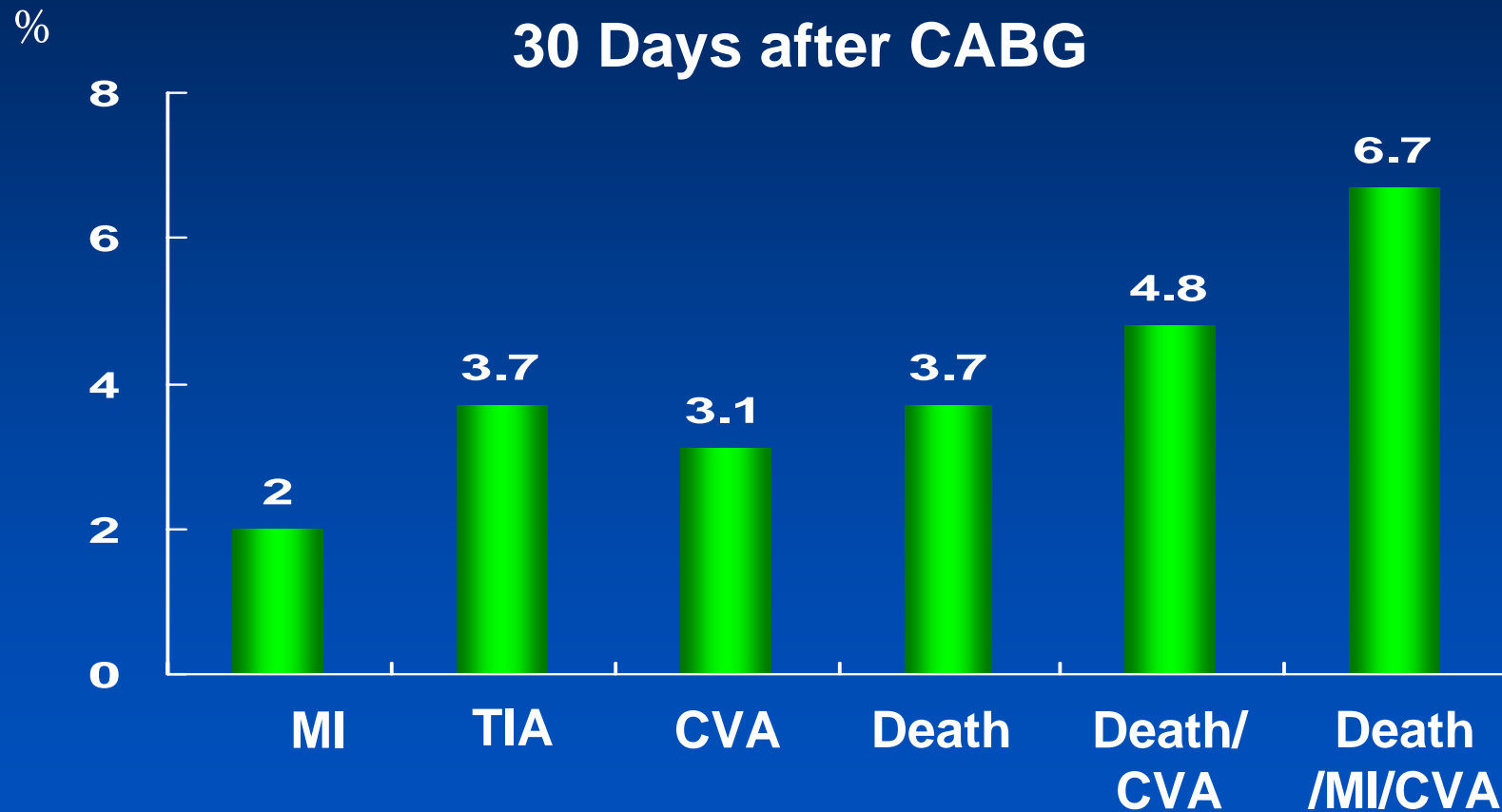
# Comparison CAS vs. CEA in Open Heart Surgery with CABG (N=167)

## 30 Days Adverse Events



Ziada KM et al, Am J Cardiol 2005;96:519-523

# Staged CAS Followed by CABG in Asymptomatic Severe Carotid Stenosis Patients (N=356)



*Vand der Heyden J et al, Circulation 2007;116:2036-2042*



# Staged CAS followed by CABG in Asymptomatic Severe Carotid Stenosis Patients (N=356)

## 5-Year Event Rates



*Vand der Heyden J et al, Circulation 2007;116:2036-2042*

# AMC Experience

# Carotid Stenting in AMC

- From 01/2001' to 11/2007'
- 42 patients (staged bilateral procedure in 2 patients)
- Use of EPD : 39/44 lesions (89%)
  - Balloon type : 7/39 (16%)
  - Filter type : 32/39 (73%)
- All severe ( $\geq 70\%$ ) ICA stenosis

# Baseline Characteristics

AMC

Variables	N=42
Age, years	67.3±6.6
Sex, men	21 (50%)
Diabetes	21 (50%)
Hypertension	28 (66.7%)
Dyslipidemia	19 (45.2%)
Smoking	28 (66.7%)
Previous myocardial infarction	7 (16.7%)
Previous coronary angioplasty	7 (16.7%)
Previous congestive heart failure	11 (26.2%)
Previous carotid angioplasty	4 (9.5%)
Previous CEA	0
Previous head/neck radiotherapy	0
Previous TIA	0
Previous stroke	7 (16.7%)
Peripheral vascular disease	1 (2.4%)
Chronic lung disease	1 (2.4%)

# Baseline Characteristics

AMC

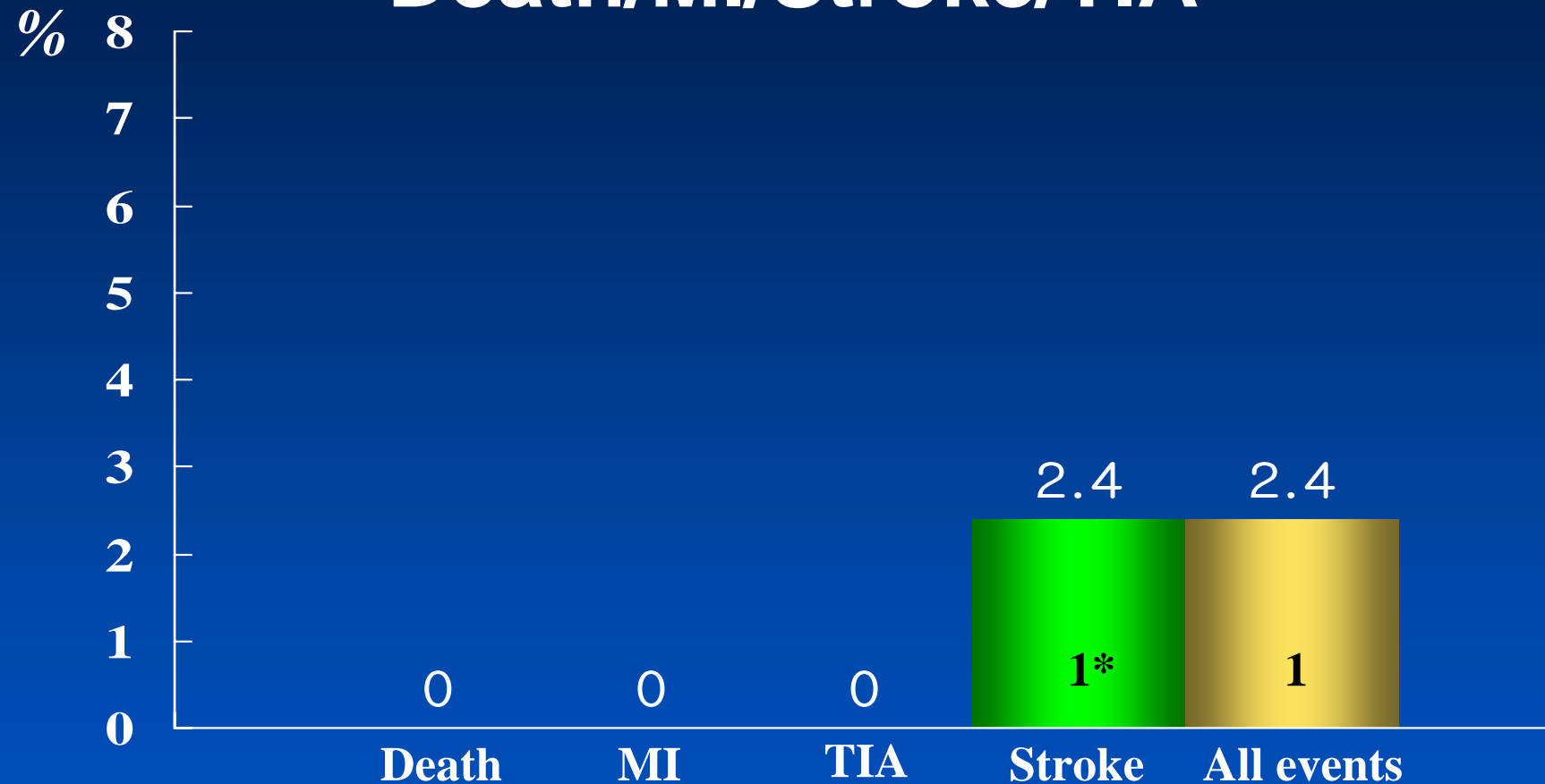
Variables	N=42 (44 lesions)
Chronic renal failure	3 (7.1%)
Atrial fibrillation	2 (4.8%)
Acute coronary syndrome	27 (64.3%)
Severe coronary artery disease	
2 vessel disease	5 (11.9%)
3 vessel disease	27 (64.3%)
Left main plus 3 vessel disease	10 (23.8%)
Left ventricular ejection fraction (%)	56.5 ± 9.3
Study Population Classification	
Symptomatic high risk	7 (15.9%)
Symptomatic low risk	0
Asymptomatic high risk	37 (84.1%)
Asymptomatic low risk	0
<b>Time interval between CAS and CABG</b>	<b>65.5 ± 162.9 days</b>
Dual antiplatelet therapy	42 (100%)

# Angiographic and Procedural Characteristics

Patients (Lesions)	42 (44)
Degree of stenosis	
Severe stenosis (>90%)	4 lesions (9.1%)
Severe stenosis (70-90%)	40 lesions (90.9%)
Mild to moderate stenosis	0
Common carotid artery stenosis	2 (4.5%)
Bilateral ICA stenosis	2 patients (4.8%)
Right ICA stenosis	26 lesions (59.1%)
Left ICA stenosis	16 lesions (36.4%)
Success rate	44 lesions (100%)
Protection device	39 lesions (88.6%)
Balloon type	7 lesions (15.9%)
Filter type	32 lesions (72.7%)
Number of used stent	1.02 per lesion
Length of used stent, mm	36.7 ± 7.3
Average stent diameter, mm	6.7 ± 0.6

# In-hospital outcomes

## Death/MI/Stroke/TIA



\*Stroke: 1 minor, asx high risk with EPD, minor impairment at discharge

**From CAS to CABG**  
**No further events**

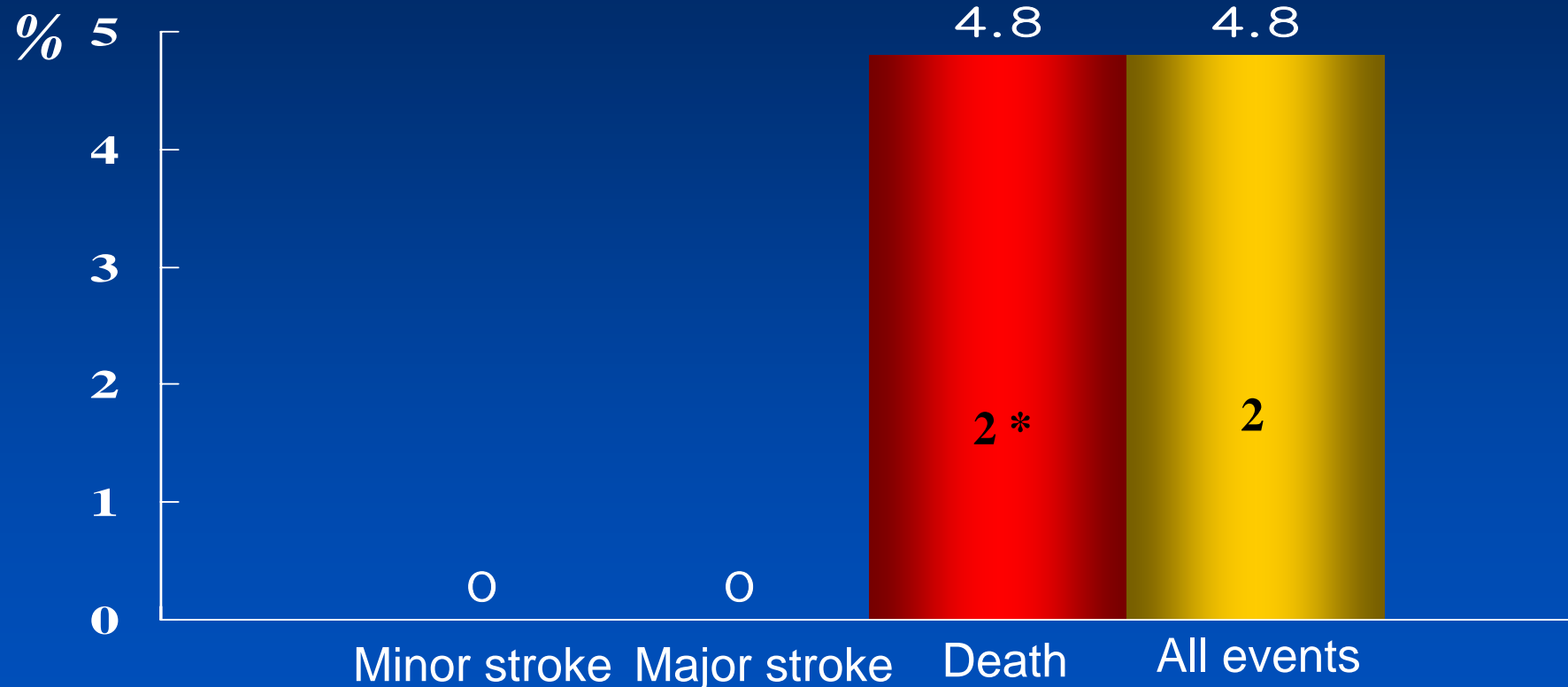
**30-day After CABG**  
**No further events**



# Long-term outcomes

## Death/Stroke

Follow-up duration : median 33.1 (24.9-49.8) months



\* Only 2 additional deaths (noncardiac death)

# Conclusions

- **There is no strong consensus regarding the prophylactic carotid revascularization in patients scheduled for CABG.**
- **Carotid endarterectomy is probably recommended before CABG or concomitant to CABG in patients with a symptomatic or asymptomatic patients with unilateral or bilateral internal carotid stenosis of 80% or more.**
- **Recent data suggest carotid stenting before CABG may be another viable treatment option.**

# Conclusions

## Future Direction

- **The best strategy for managing patients who have combined coronary & carotid disease will be established only by prospective, randomized trials.**
  - **CEA or CAS followed by CABG**
  - **CABG alone**
  - **CABG followed by CEA or CAS**
- **Until then, the optimal treatment strategy should be determined on a case-by-case basis by a multidisciplinary team that includes a neurologist, a vascular surgeon, and an interventionists.**