

# HOT TOPICS IN CARDIOLOGIA 2023

**13 e 14 Novembre 2023**

Villa Doria D'Angri  
Via F. Petrarca 80, Napoli

**Presidente del congresso: Dr. Ciro Mauro**

Direttore UOC di Cardiologia UTIC con emodinamica  
AORN Cardarelli, Napoli

# Stenosi Carotidea Asintomatica

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Potenza

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degli studi Federico II, Napoli



**Eugenio Stabile, MD, PhD, FESC**

# Basic principles of screening

The condition should be an important health problem.

There should be a treatment for the condition.

Facilities for diagnosis and treatment should be available.

There should be a latent stage of the disease.

There should be a test or examination for the condition.

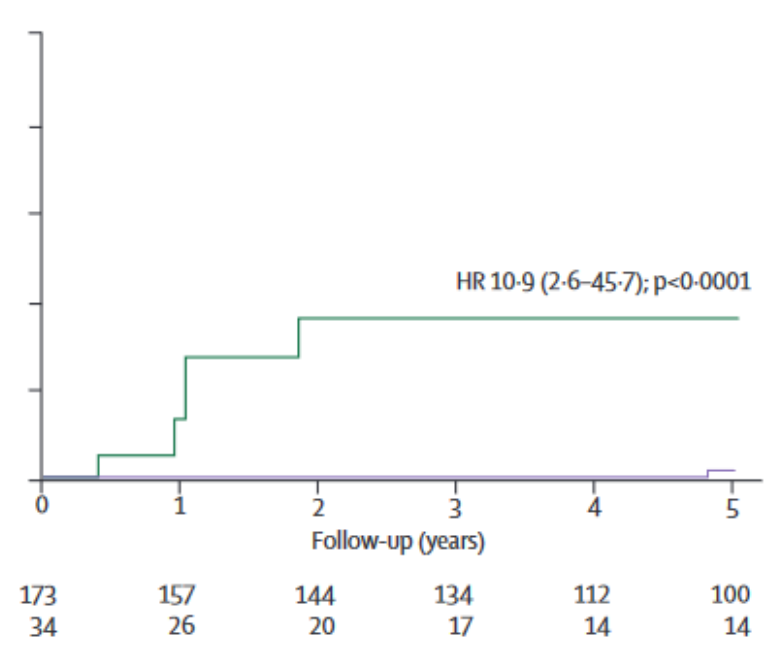
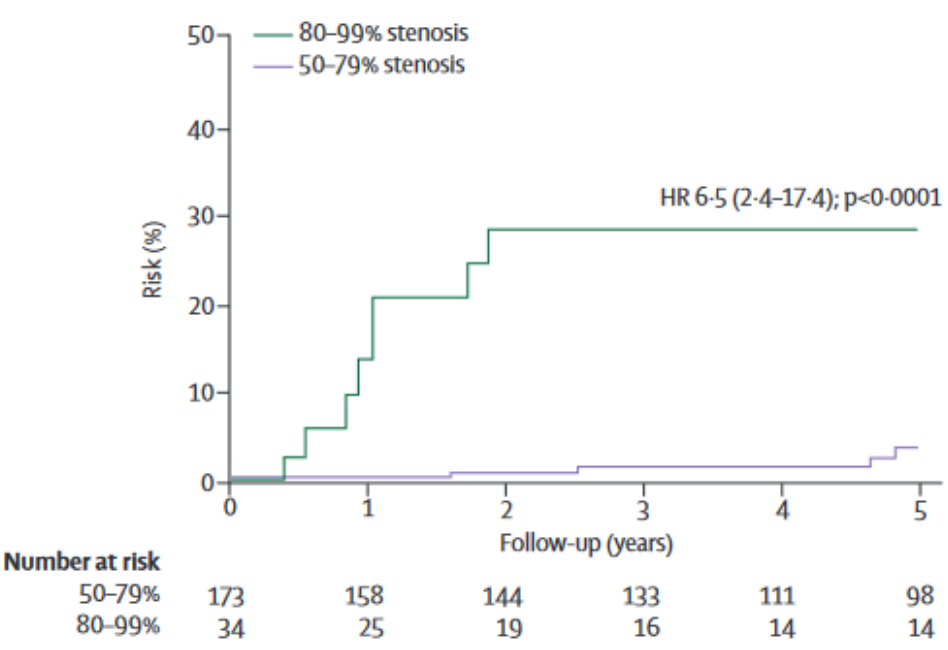
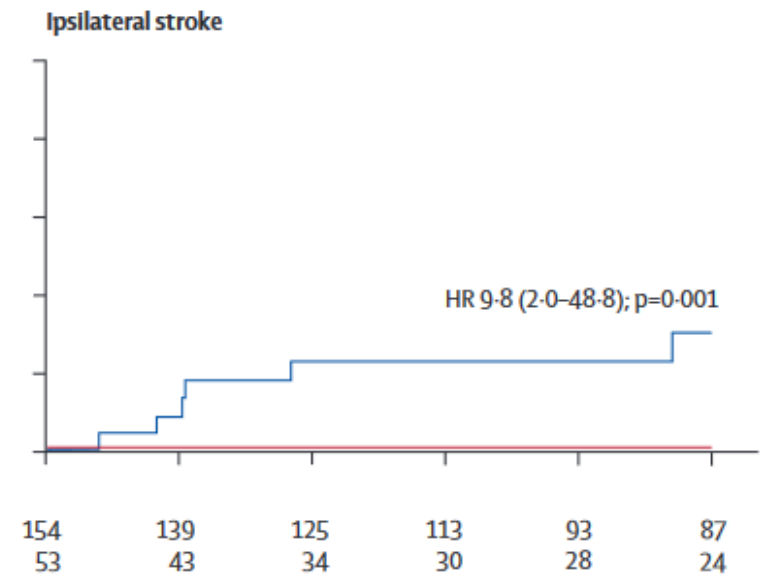
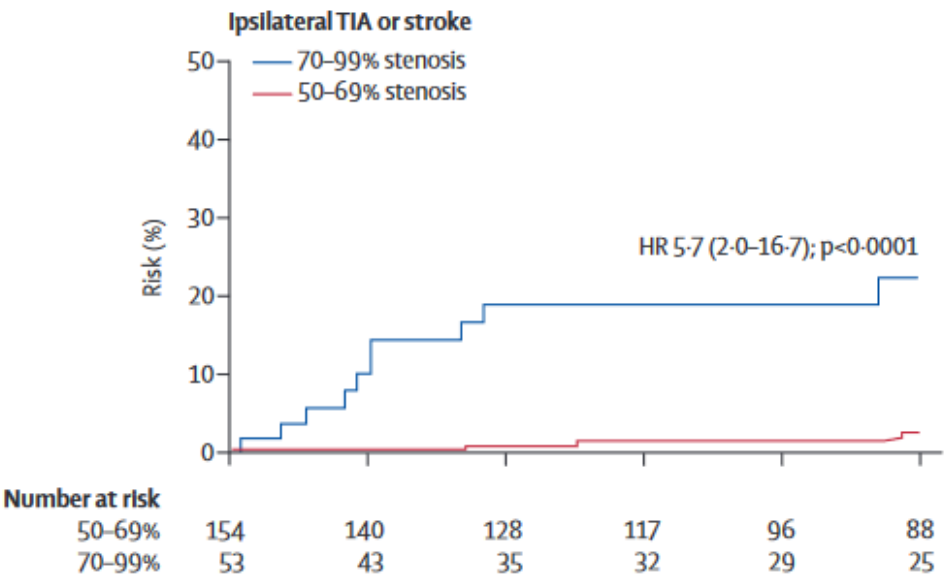
The test should be acceptable to the population.

The natural history of the disease should be adequately understood.

There should be an agreed policy on whom to treat.

The cost of finding a case should be balanced in relation to overall medical expenditure.





**Risk of stroke  
in relation to  
degree of  
asymptomatic  
carotid  
stenosis**



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## Risk Reduction of Any Stroke or Operative Death at 5 Years After CEA in Symptomatic Patients From 3 Randomized Clinical Trials



Stenosis (%)	ARR (% , 95% CI)	<i>p</i>	RRR (95% CI)
Near-occlusion	−0.1 (−10.3 to 10.2)	0.6	0.98 (0.61 to 1.59)
70–99	15.6 (9.8 to 20.7)	0.00001	0.52 (0.40 to 0.64)
50–69	7.8 (3.1 to 12.5)	0.002	0.72 (0.58 to 0.86)
30–49	2.6 (−1.7 to 6.9)	0.7	0.90 (0.75 to 1.04)
<30	−2.6 (−6.2 to 0.9)	0.03	1.17 (0.90 to 1.43)

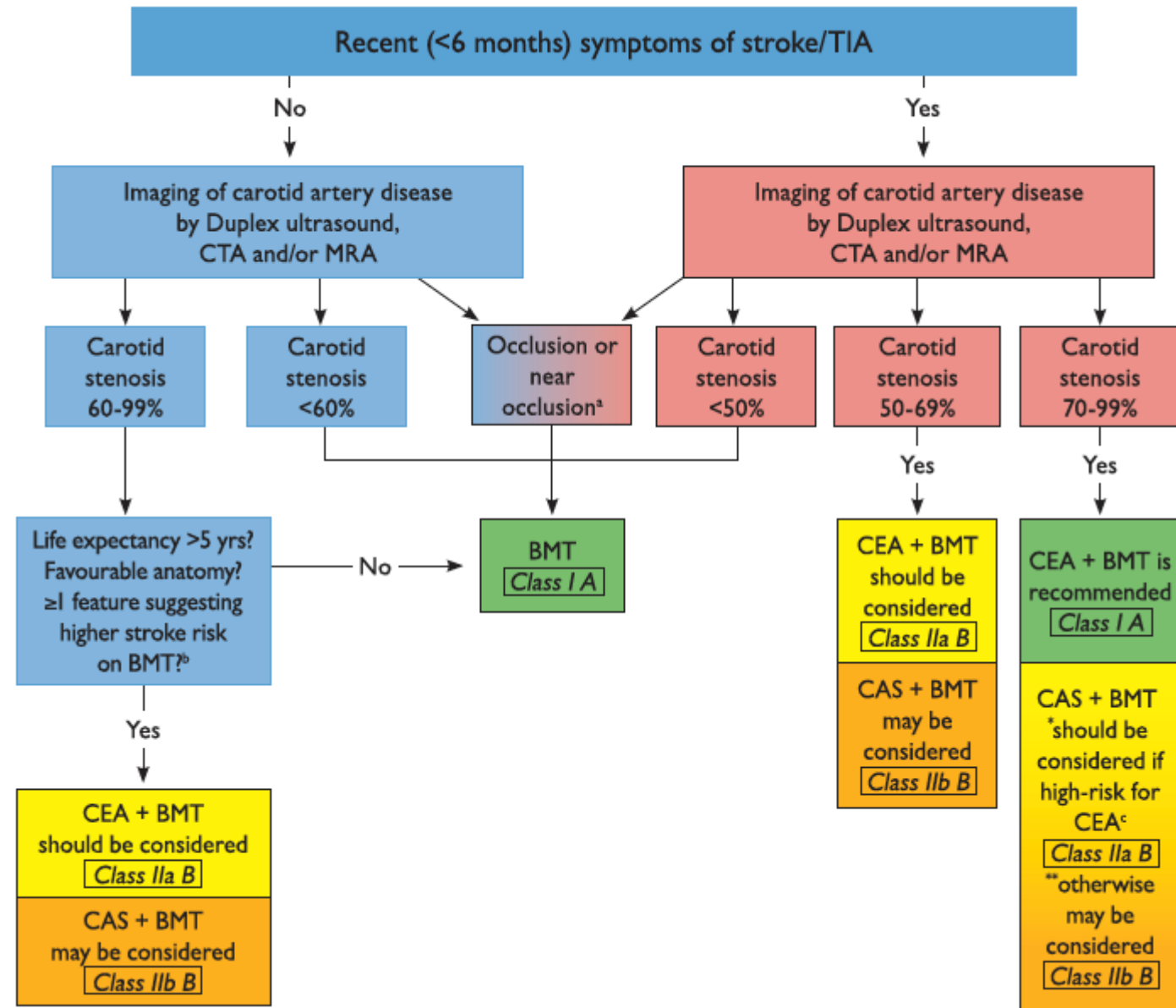
Rothwell PM et al. Lancet 2003;361:107–16 (87)



## 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS)

CAS offers advantages over CEA in the presence of

- a ‘hostile neck’ (previous radiation, recurrent stenosis),
- contralateral recurrent laryngeal nerve palsy
- challenging surgical access [very high ICA lesions, proximal common carotid artery (CCA) lesions]
- patients at higher risk for suffering perioperative cardiac complications



# Basic principles of screening



World Health  
Organization

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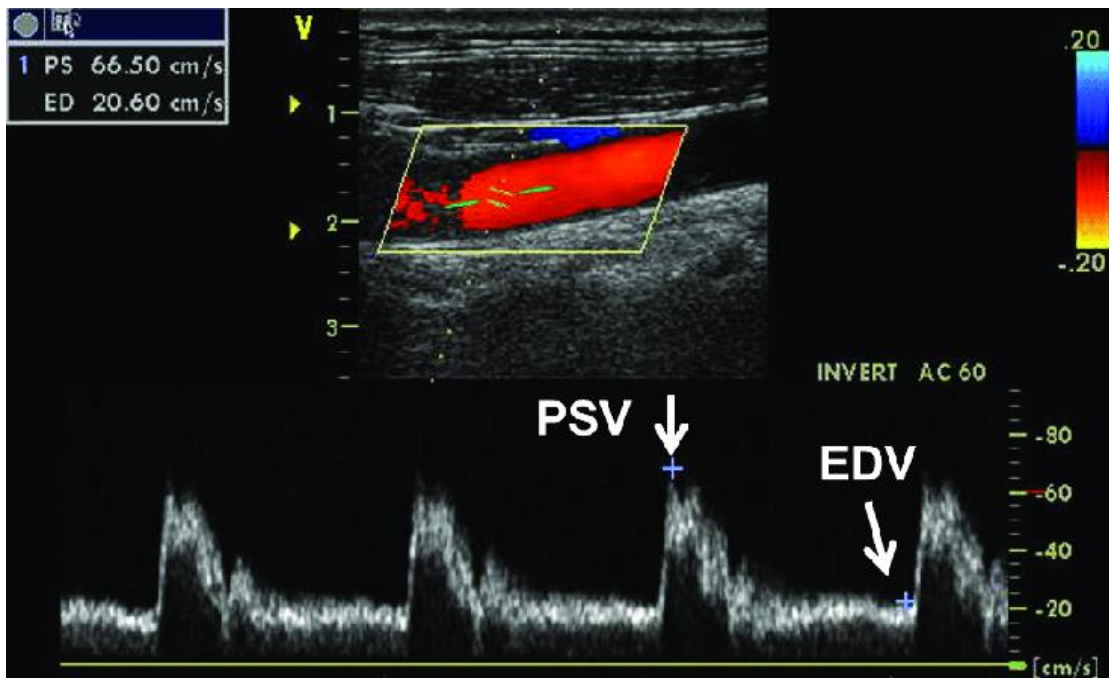
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Degree of Stenosis (%)	Primary Parameters		Additional Parameters	
	ICA PSV (cm/sec)	Plaque Estimate (%)*	ICA/CCA PSV Ratio	ICA EDV (cm/sec)
Normal	<125	None	<2.0	<40
<50	<125	<50	<2.0	<40
50–69	125–230	≥50	2.0–4.0	40–100
≥70 but less than near occlusion	>230	≥50	>4.0	>100
Near occlusion	High, low, or undetectable	Visible	Variable	Variable
Total occlusion	Undetectable	Visible, no detectable lumen	Not applicable	Not applicable

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
DUS (as first-line imaging), CTA and/or MRA are recommended for evaluating the extent and severity of extracranial carotid stenoses. <sup>99</sup>	I	B
When CAS is being considered, it is recommended that any DUS study be followed by either MRA or CTA to evaluate the aortic arch as well as the extra- and intracranial circulation. <sup>99</sup>	I	B
When CEA is considered, it is recommended that the DUS stenosis estimation be corroborated by either MRA or CTA (or by a repeat DUS study performed in an expert vascular laboratory). <sup>99</sup>	I	B





## Second Manifestations of ARterial disease

Asymptomatic  
Carotid Artery  
Stenosis and the  
Risk of New  
Vascular Events in  
Patients With  
Manifest Arterial  
Disease

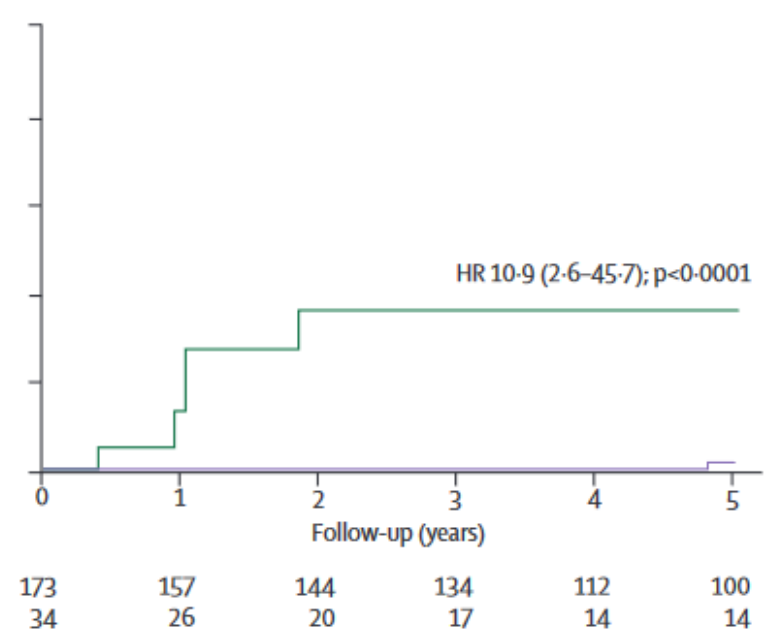
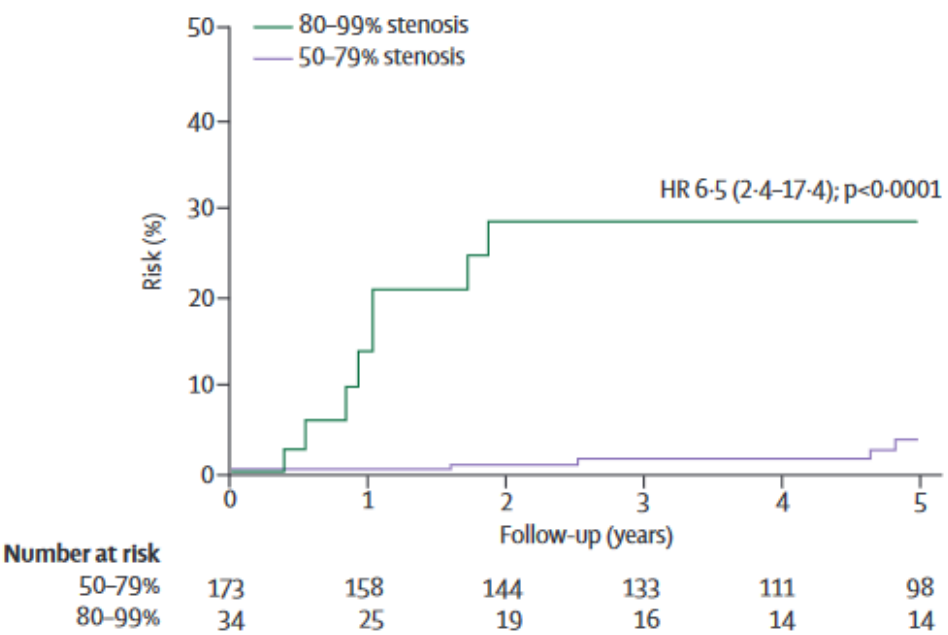
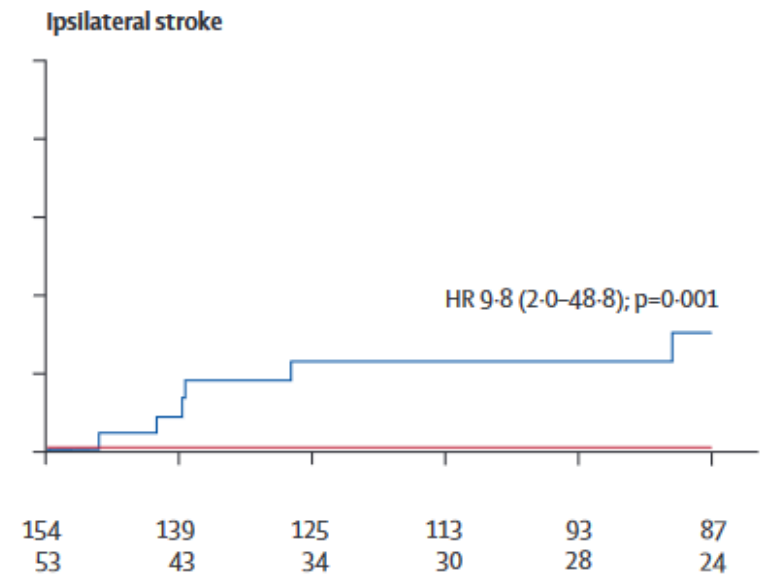
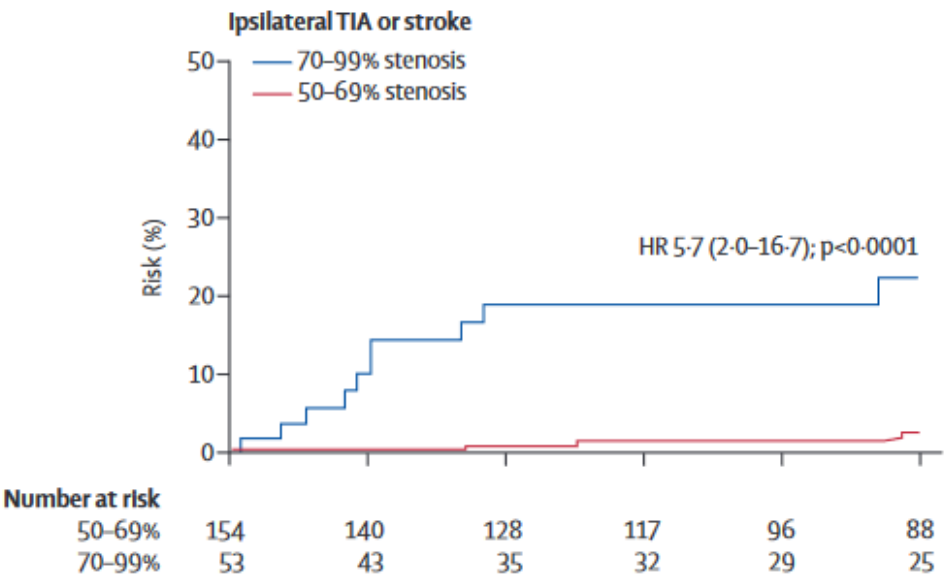
**The SMART Study**

**TABLE 3. Number of Events in Patients With and Without CAS During Follow Up**

	No Asymptomatic CAS (n=2463)
after 5 years	
Nonvascular death	74 (3)
Vascular death	114 (5)
MI	137 (6)
Ischemic stroke	43 (2)
All first vascular events	209 (9)
CEA	4 (0)
Endovascular intervention	...

Data represent number of patients with percentages in parentheses.



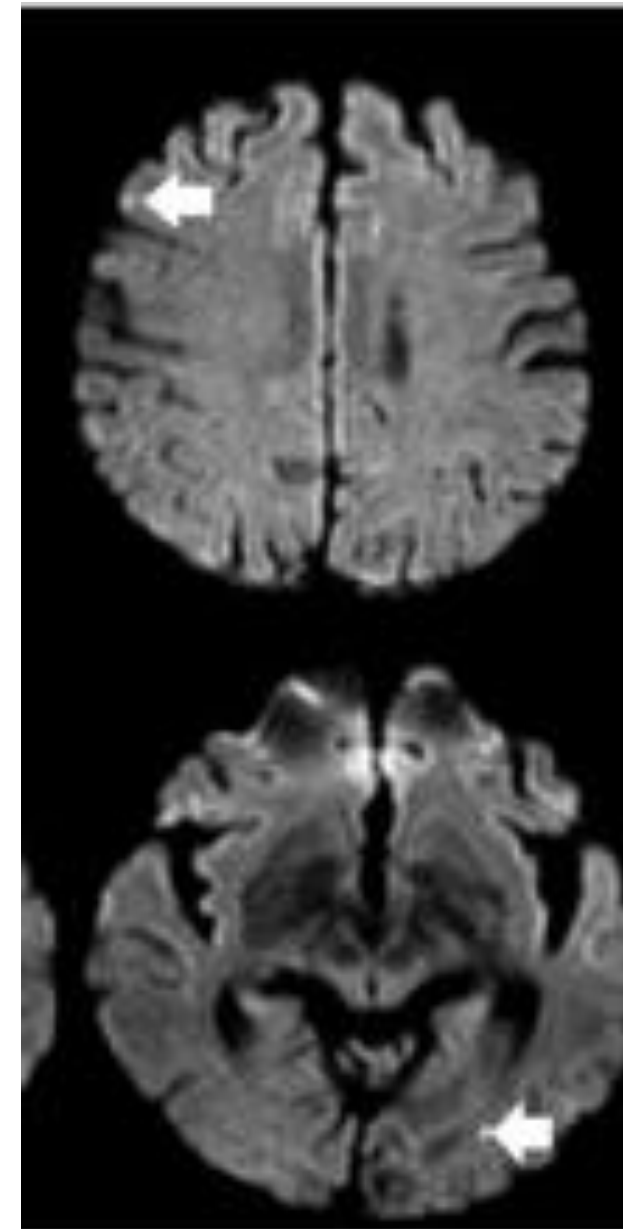


**Risk of stroke  
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**2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS)**

<b>Clinical<sup>a</sup></b>	<ul style="list-style-type: none"> <li>• Contralateral TIA/stroke<sup>121</sup></li> </ul>
<b>Cerebral imaging</b>	<ul style="list-style-type: none"> <li>• Ipsilateral silent infarction<sup>122</sup></li> </ul>
<b>Ultrasound imaging</b>	<ul style="list-style-type: none"> <li>• Stenosis progression (&gt; 20%)<sup>123</sup></li> <li>• Spontaneous embolization on transcranial Doppler (HITS)<sup>124</sup></li> <li>• Impaired cerebral vascular reserve<sup>125</sup></li> <li>• Large plaques<sup>b126</sup></li> <li>• Echolucent plaques<sup>96</sup></li> <li>• Increased juxta-luminal black (hypoechoogenic) area<sup>127</sup></li> </ul>
<b>MRA</b>	<ul style="list-style-type: none"> <li>• Intraplaque haemorrhage<sup>128</sup></li> <li>• Lipid-rich necrotic core</li> </ul>



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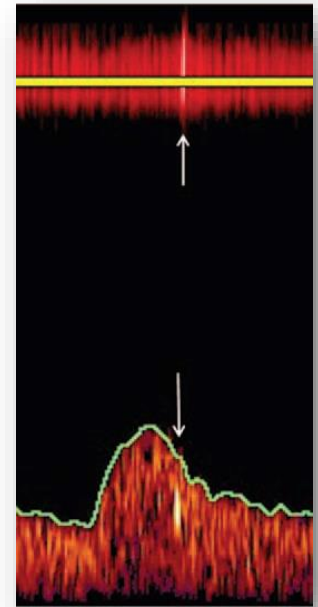
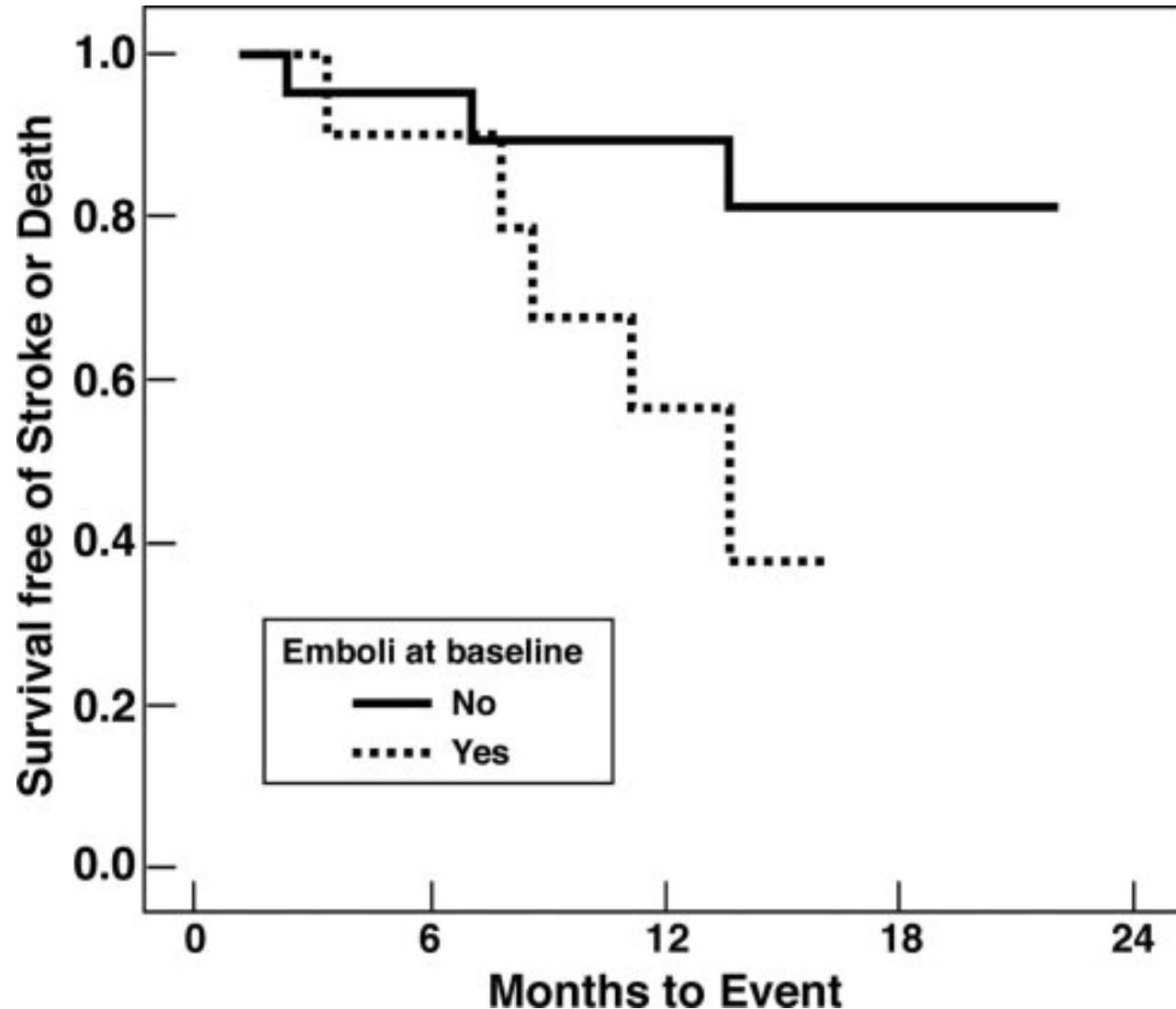
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# Microembolic Signals (MES)

Transcranial Doppler embolus detection could identify the proportion of patients who would be at high enough risk to benefit CEA/CAS

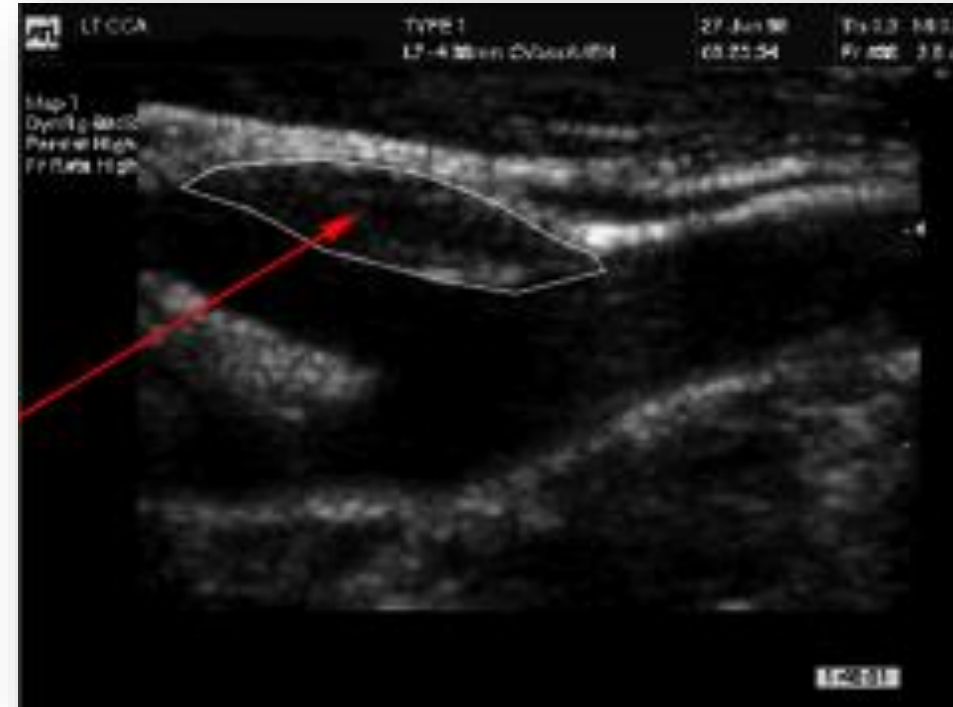


# Identification of the Unstable Carotid Plaque Using Ultrasound

The presence of a *juxtaluminal black area of  $> 8 \text{ mm}^2$*  in a plaque (CAP), without a visible echogenic cap, identified a group of patients (21%) that had an average annual stroke rate of **4.1%**.

Independent predictors of risk:

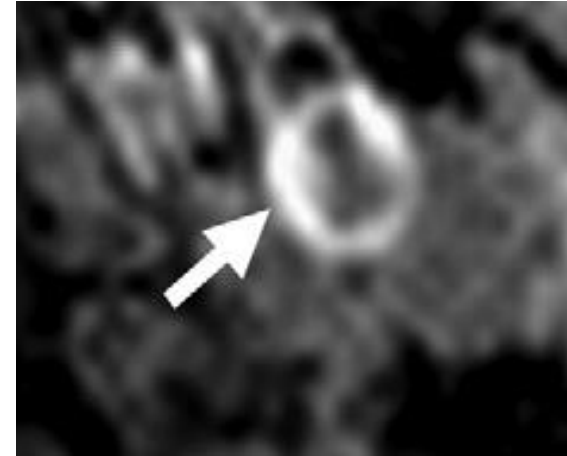
1. baseline degree of stenosis
2. history of contralateral stroke or TIA
3. size of black juxtaluminal CAP  $\geq 8 \text{ mm}^2$
4. presence of discrete white areas in a hypoechoic CAP



# Identification of the Unstable Carotid Plaque Using MRI

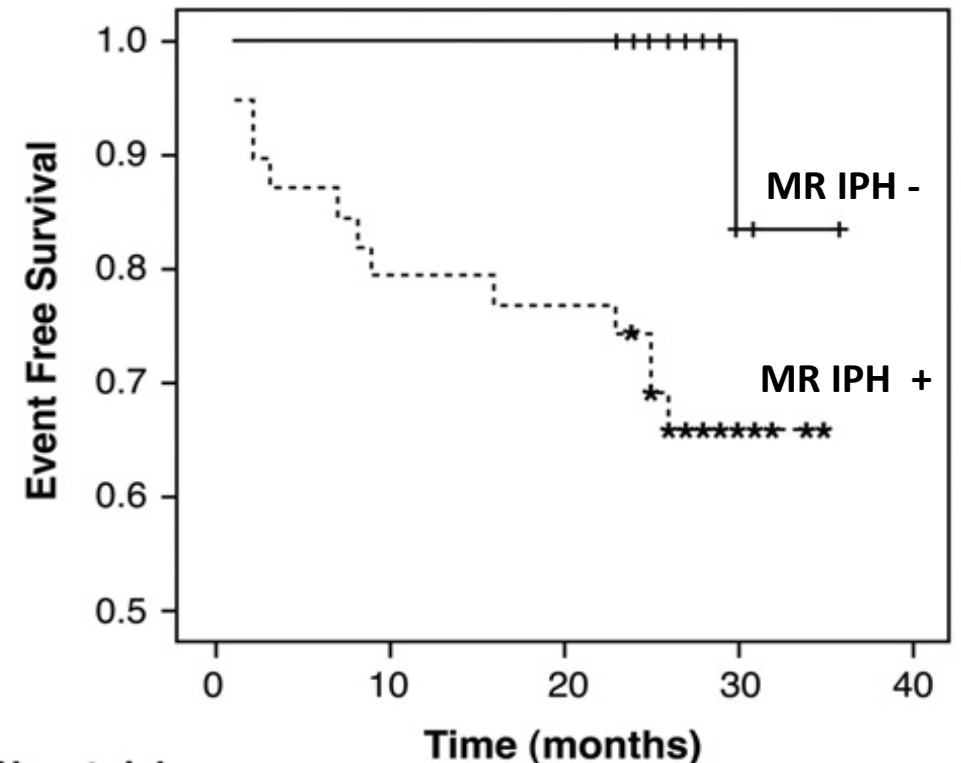
Intraplaque hemorrhage increases necrotic core size and plaque volume and can be considered is a marker of plaque instability

Paraskevas et al. *Stroke* 2014

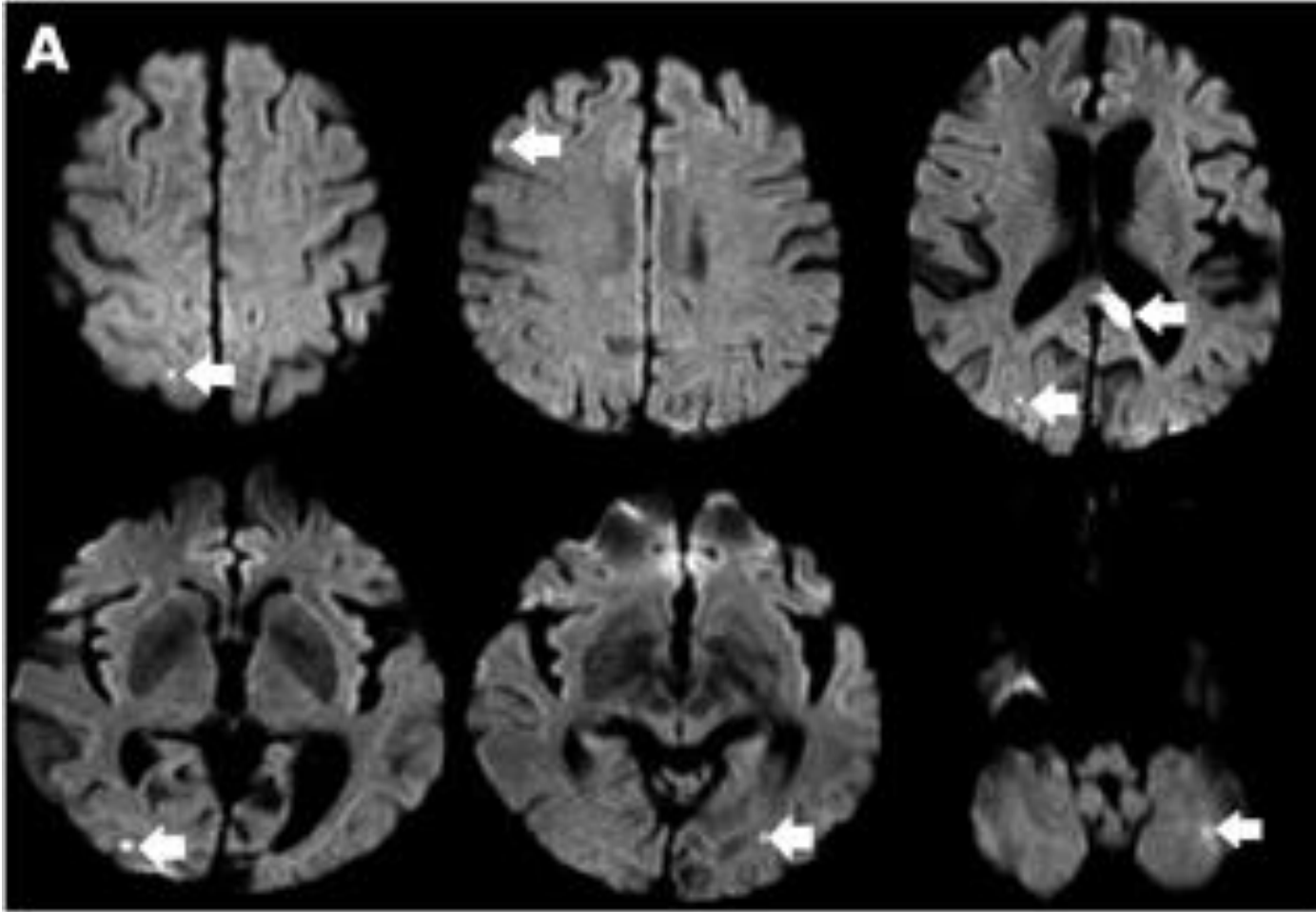


In a study of 75 men with 50% to 70% ACS, MRI identified the presence of intraplaque hemorrhage in 36 (36.7%) of 98 carotid arteries. In this high-risk group, 2 strokes and 4 TIAs occurred during a 2 years follow-up. Strokes or TIAs did not develop in the patients without intraplaque hemorrhage.

Altaf N et al. *J Vasc Surg.* 2008



# Identification of the Unstable Carotid Plaque Using Head CT/MRI



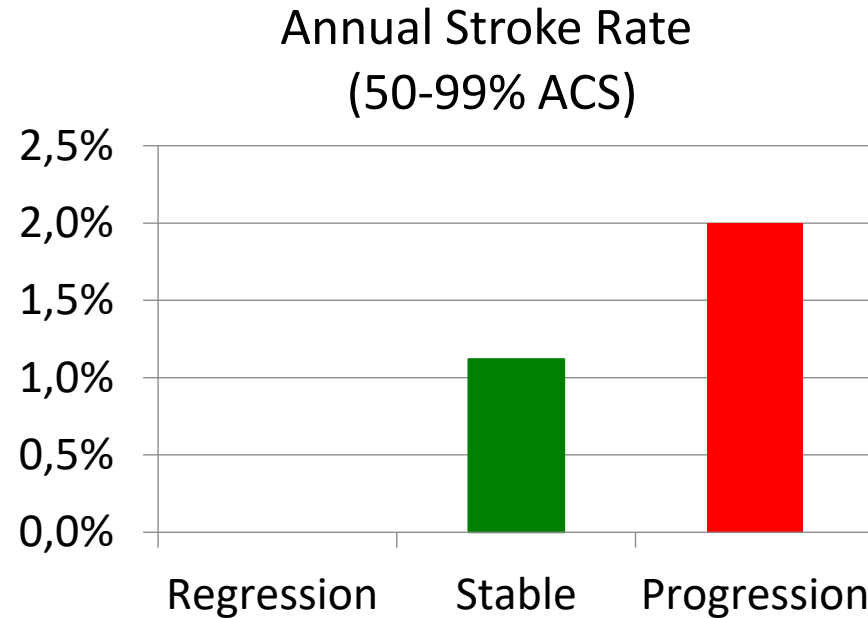
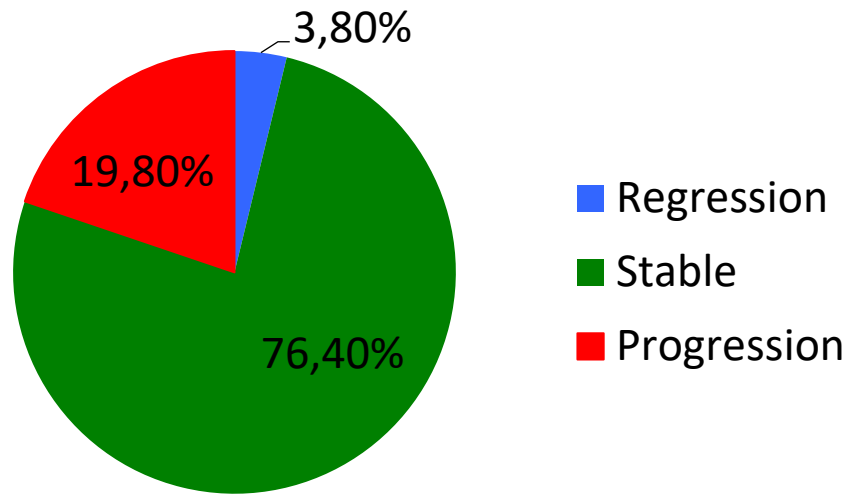
Embolic infarcts were present in 9.6% of the patients with 60% to 99% stenosis in relation to the normal distal internal carotid.

This high-risk group which had an average annual stroke rate of **3.5%** thus suggesting that ACS patients found to have prior infarcts should be referred for revascularization.





# The role of Progression in the Severity of ACS



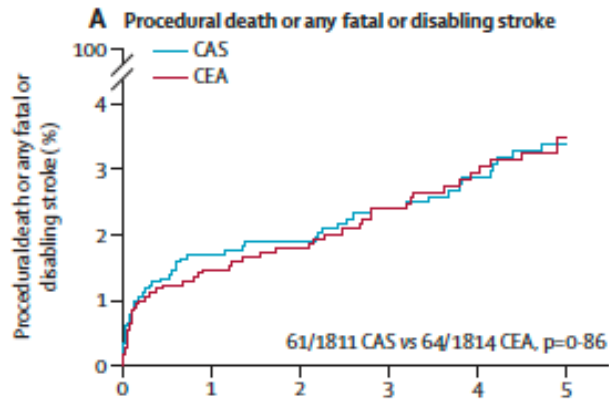
For patients with 80% to 99% baseline stenosis, the annual stroke rate was **1.7%** in the absence and **3.1%** in the presence of progression.

In this study the incidence of plaque progression was inversely proportional to the severity of baseline stenosis and that both baseline stenosis and progression were independent predictors of stroke risk.



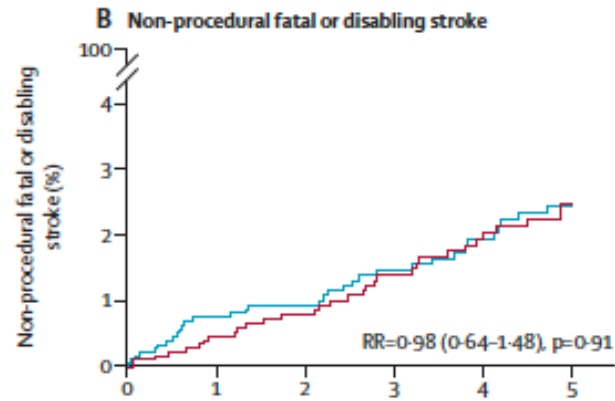
# Latest Data from : ACTS – 2

The difference is due to the highest incidence of non-disabling strokes in CAS



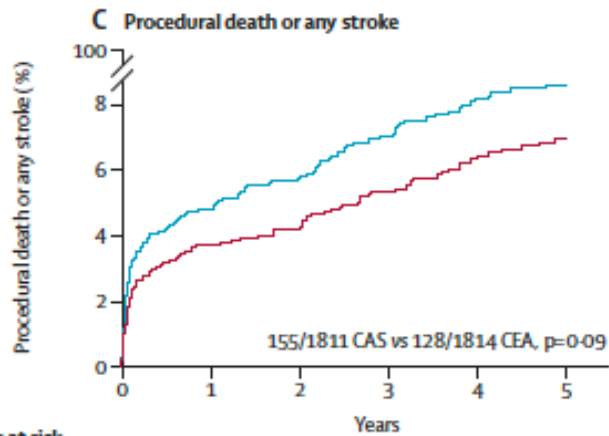
Number at risk (number of events, annual rate [%])\*

	CAS	1811	1639	1408	1186	993	789
		(30, 1.8%)	(3, 0.2%)	(7, 0.5%)	(5, 0.5%)	(5, 0.6%)	(11, 0.5%)
	CEA	1814	1625	1422	1196	988	814
		(26, 1.5%)	(5, 0.3%)	(8, 0.6%)	(6, 0.6%)	(5, 0.6%)	(14, 0.6%)



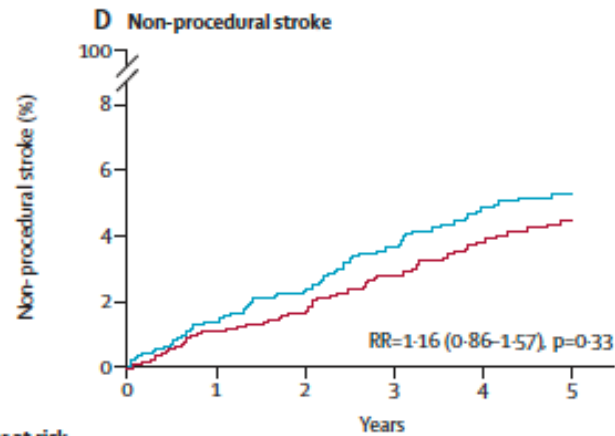
Number at risk (number of events, annual rate [%])\*

	CAS	1811	1639	1408	1186	993	789
		(13, 0.8%)	(3, 0.2%)	(7, 0.5%)	(5, 0.5%)	(5, 0.6%)	(11, 0.5%)
	CEA	1814	1625	1422	1196	988	814
		(8, 0.5%)	(5, 0.3%)	(8, 0.6%)	(6, 0.6%)	(5, 0.6%)	(13, 0.6%)



Number at risk (number of events, annual rate [%])\*

	CAS	1811	1588	1353	1131	935	741
		(86, 5.2%)	(15, 1.0%)	(17, 1.4%)	(13, 1.3%)	(4, 0.5%)	(20, 1.0%)
	CEA	1814	1587	1386	1156	946	775
		(66, 4.0%)	(8, 0.5%)	(15, 1.2%)	(11, 1.1%)	(6, 0.7%)	(22, 1.1%)



Number at risk (number of events, annual rate [%])\*

	CAS	1811	1588	1353	1131	935	741
		(23, 1.4%)	(15, 1.0%)	(17, 1.4%)	(13, 1.3%)	(4, 0.5%)	(19, 0.9%)
	CEA	1814	1587	1386	1156	946	775
		(19, 1.1%)	(8, 0.5%)	(15, 1.2%)	(11, 1.1%)	(6, 0.7%)	(20, 1.0%)





# Asymptomatic Carotid Surgery Trial (ACST-2)

Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
The use of embolic protection devices should be considered in patients undergoing carotid artery stenting.	IIa	C

Embollic protection device was not used in as much as 15% of patients

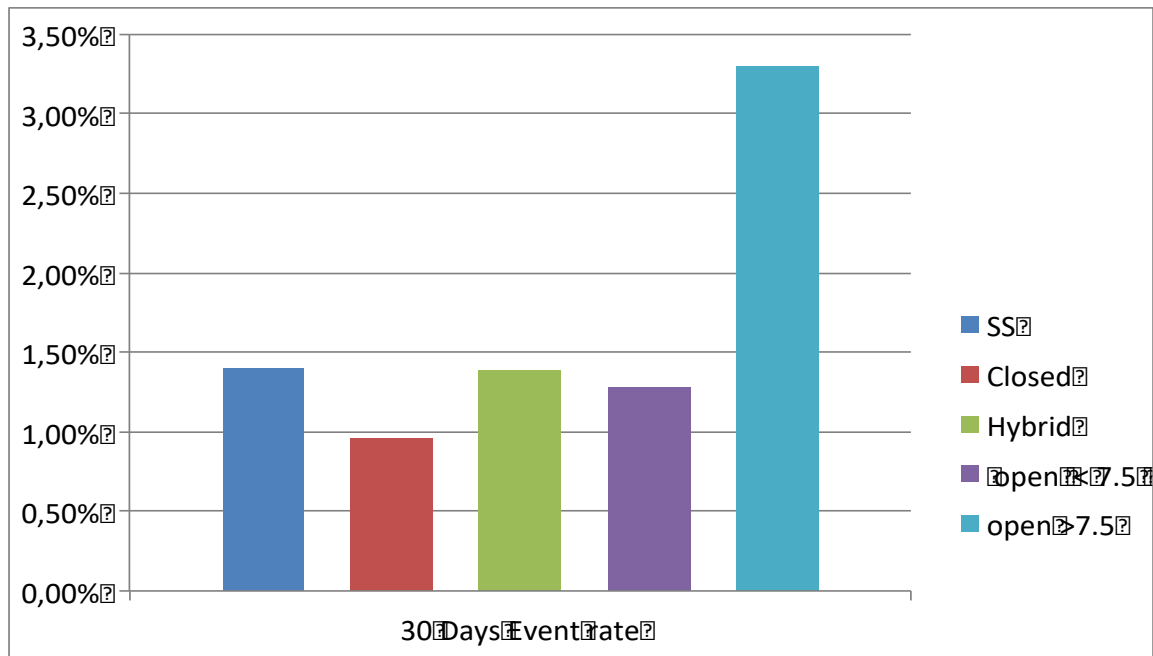
	Name	Number	
<b>Filter</b>		<b>1097</b>	<b>69%</b>
	Filterwire	391	
	Emboshield	327	
	Spider	241	
	Accunet	78	
	Angioguard	55	
	Other	5	
<b>Proximal occlusion</b>		<b>238</b>	<b>15%</b>
	Moma	204	
	Gore flow reversal	27	
	Other	7	
<b>Distal balloon</b>		<b>9</b>	<b>1%</b>
<b>None*</b>		<b>244</b>	<b>15%</b>
<b>Total</b>		<b>1588</b>	<b>100%</b>

\* 8 centres decided generally not to use any cerebral protection device



# Asymptomatic Carotid Surgery Trial (ACST-2)

## Post CAS 30 days stroke rate according to stent design and cell area (mm<sup>2</sup>)



Stabile E et al. *EuroIntervention* 2016

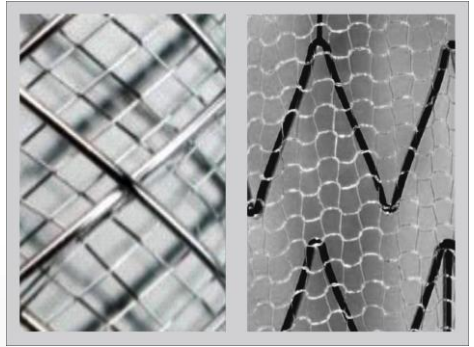
Open cell designed stents with large cell area were used in used in as much as 20% of patients

Stent name	Number	
<b>Closed cell</b>	<b>739</b>	<b>47%</b>
Wallstent	469	
XAct	261	
Other	9	
<b>Open cell</b>	<b>482</b>	<b>30%</b>
Precise	198	
Protege Rx	144	
Rx Acculink	122	
Other	18	
<b>Hybrid</b>	<b>180</b>	<b>11%</b>
Cristallo Ideale	170	
Other	10	
<b>Membrane</b>	<b>176</b>	<b>11%</b>
Roadsaver	109	
CGuard	67	
<b>Other</b>	<b>11</b>	<b>1%</b>
<b>Total</b>	<b>1588</b>	<b>100%</b>

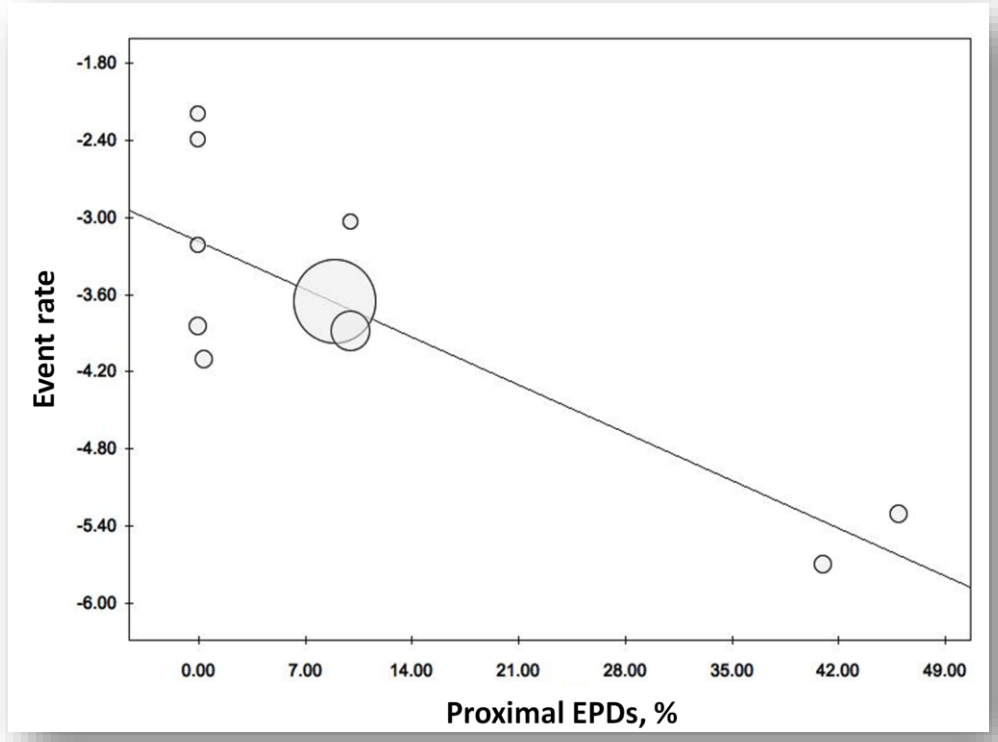


# Double layered stents for carotid angioplasty: A meta-analysis of available clinical data

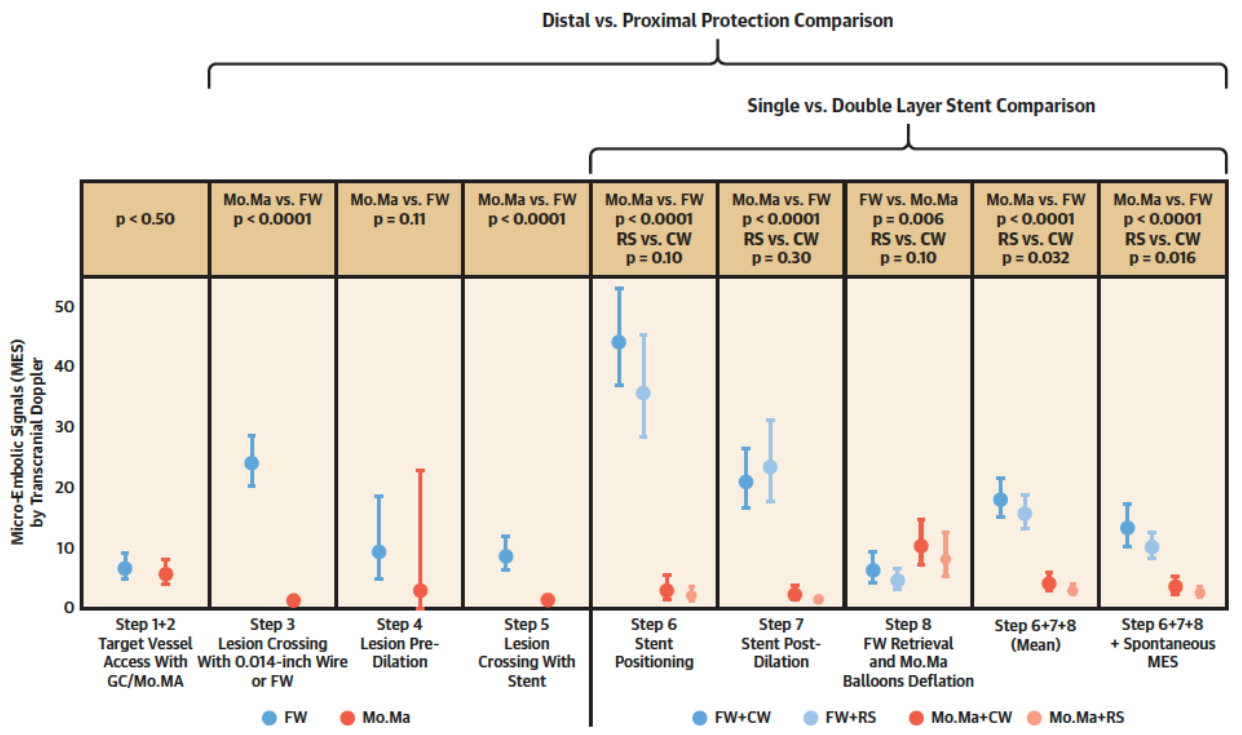
Anna Sannino, MD<sup>1,2\*</sup> | Giuseppe Giugliano, MD, PhD<sup>1,2\*</sup> | Evelina Toscano, MD<sup>1,2</sup> | Gabriele G. Schiattarella, MD<sup>1,2</sup> | Anna Franzone, MD, PhD<sup>1,2</sup> | Tullio Tesorio, MD<sup>3</sup> | Bruno Trimarco, MD<sup>1,2</sup> | Giovanni Esposito, MD, PhD<sup>1,2</sup> | Eugenio Stabile, MD, PhD<sup>1,2</sup>



# Carotid Wallstent Versus Roadsaver Stent and Distal Versus Proximal Protection on Cerebral Microembolization During Carotid Artery Stenting



Sannino A et al. Cath Cardiovasc Int 2018

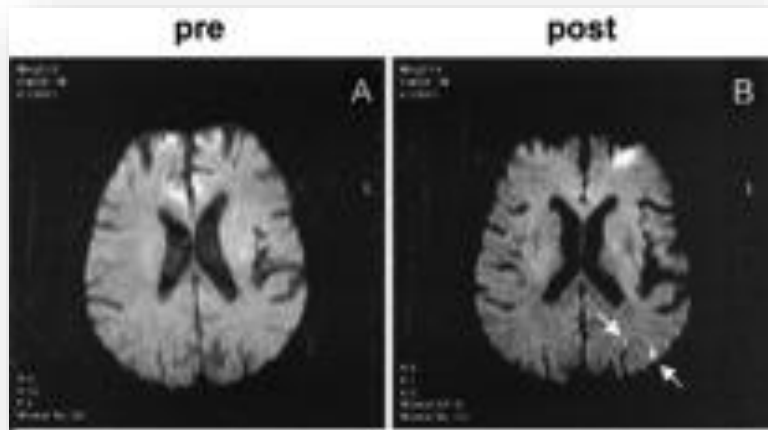
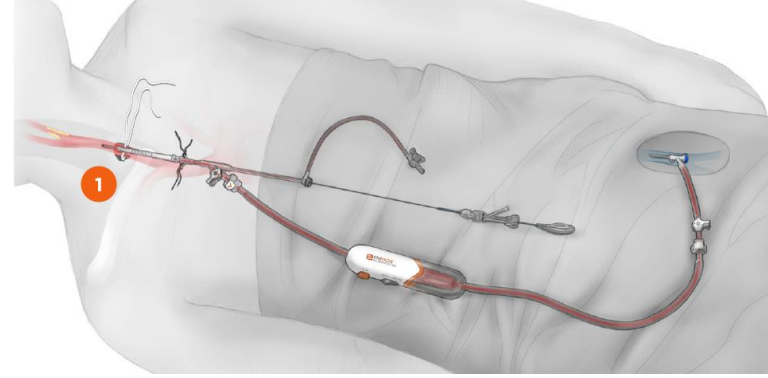


Montorsi P. et al. J Am Coll Cardiol Intv 2020



Eugenio Stabile, MD, PhD, FESC

## Transcarotid revascularization (T-CAR)<sup>1</sup>



<i>DW-MRI parameters</i>	<i>All (n = 31)<sup>a</sup></i>
Number of subjects with DW-MRI lesion(s) pre- and postprocedure	1 (3.2%)
Number of subjects with new DW-MRI lesion(s) postprocedure	5 (16.1%)
Total number of new DW-MRI lesion(s) postprocedure	18
Number of new DW-MRI lesion(s) per subject postprocedure (min, max)	3.6 (2, 9)

DESERVE Study: 26% of subjects with new DW-MRI lesion (s) post procedure <sup>2</sup>

<sup>1</sup> Pinter et al. J Vasc Surg 2011. <sup>2</sup> Stabile et al. Int J Cardiol 2013



# ROADSTER 1

## 30-days outcomes

# ROADSTER 2

Intent to Treat (n=141)	
<b>All Stroke</b>	<b>1.4%</b>
Death	1.4%
MI	0.7%
Stroke/Death	2.8%
Stroke/Death/MI	3.5%

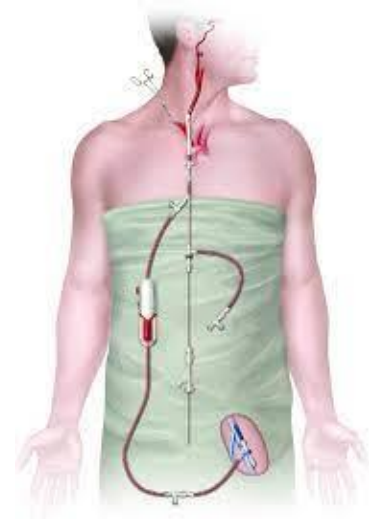
Per Protocol (n=136)	
<b>All Stroke</b>	<b>0.7%</b>
Death	1.5%
MI	0.7%
Stroke/Death	2.2%
Stroke/Death/MI	2.9%



**Investigators experienced in carotid surgery and intervention**

Intent to Treat (n=692)	
<b>Procedural Success</b>	<b>96.5%</b>
<b>Stroke</b>	<b>1.9%</b>
Death	0.4%
Stroke/Death	2.3%
Stroke/Death/MI	3.2%
CNI*	1.4%

Per Protocol (n=632)	
<b>Procedural Success</b>	<b>97.6%</b>
<b>Stroke</b>	<b>0.6%</b>
Death	0.2%
Stroke/Death	0.8%
Stroke/Death/MI	1.7%
CNI*	1.3%



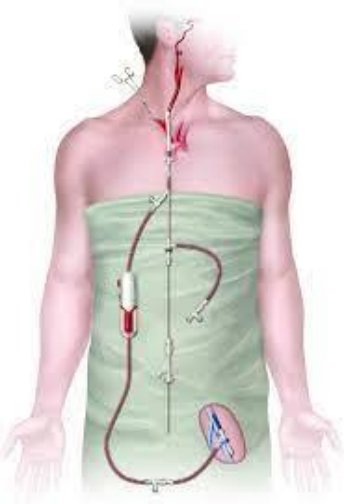
**81% of Physician were new to TCAR**

*Kwolek C. J. J Vasc Surg 2015*

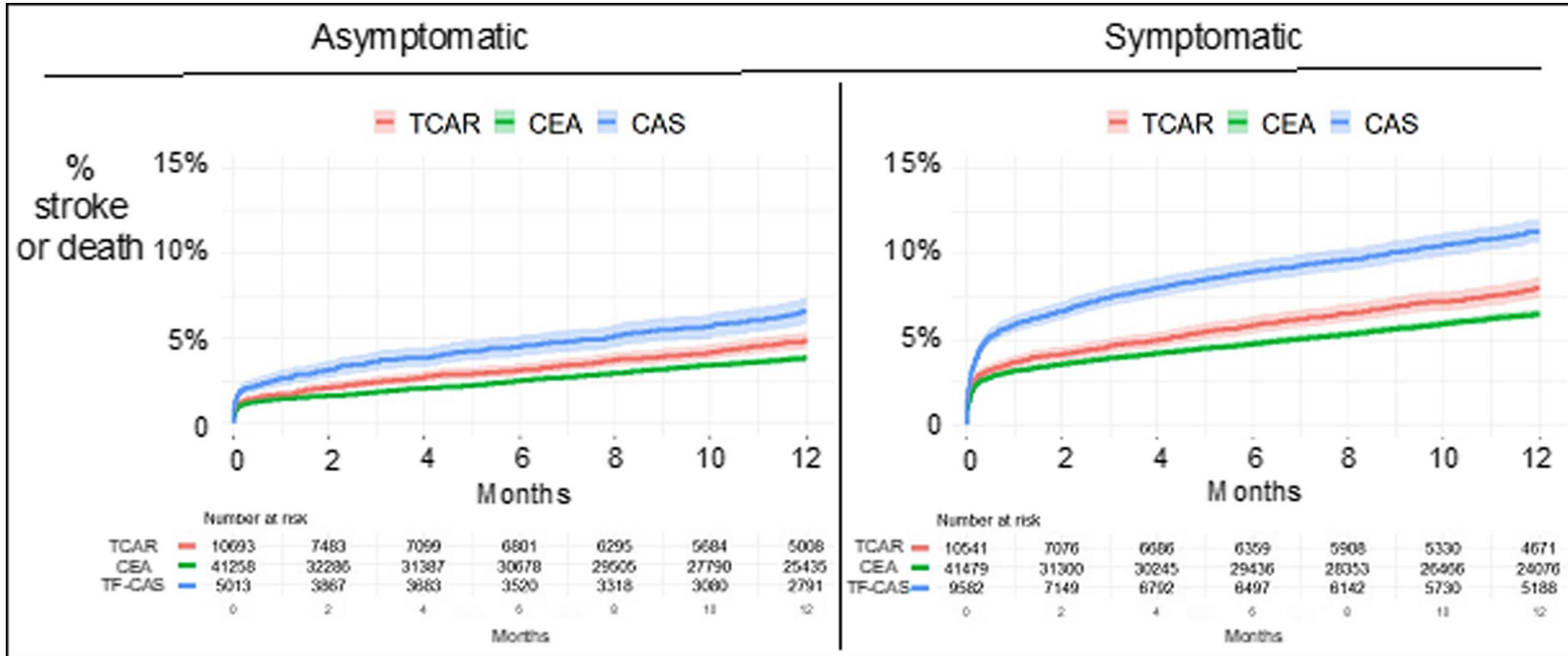
*Kashyap V. S. et al. AHA 2020*




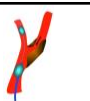

**Eugenio Stabile, MD, PhD, FESC**



# Kaplan–Meier estimated rate of stroke after TCAR, CEA, and TF-CAS, stratified by presenting neurologic symptom status





 High risk features for CEA		 High risk Feature for CAS		 High risk feature for TCAR	
Anatomic	Clinical	Anatomic	Clinical	Anatomic	Clinical
Lesions located at or above C2 Below the clavicle	Heart failure (NYHA functional class III/IV and/or LVEF <30%)	High-grade aortic arch atheroma	Elderly (>70 y)	Lesions that are <5 cm cranial to the clavicle	Obesity
Ipsilateral neck irradiation	Chronic coronary syndrome (CCS III/IV)	Type II/III aortic arch	Bleeding disorder	severe target vessel tortuosity	
Cervical kyphosis or immobility	CAD with LM or > 2 vessels >70% stenosis	Stenosis at origin of great vessels	Severe aortic stenosis	small CCA (<6 mm)	
Contralateral carotid artery occlusion	Recent myocardial infarction (<30 d)	>2 acute (90°) bends of the target vessel	Chronic renal failure	Severe calcification or the presence of thrombus in the CCA	
Contralateral laryngeal palsy	Planned open heart surgery (<30 d)	Circumferential lesion calcification	Decreased cerebral reserve	Depth of CCA, which make access difficult	
Tracheostoma	Severe aortic valvular disease	Lesion-related thrombus			
Prior ipsilateral CEA or other neck surgery	Oxygen and/or steroid dependent pulmonary disease	Tandem lesions			
Short neck	Chronic renal failure	Unable to use EPD			
	Advanced age				





Equality between CEA, CAS, TCAR... has been achieved

Technical and technological advancement will help to obtain a further improvement in acute and long term results

There is a decreasing interest for CAS (and carotid revascularization) ... and we should get together to understand the what's going on....



