51st VEITHsymposium, New York City, NY, 19th-23rd November 2024

ACUTE STROKE MANAGEMENT: HOW CAN A VASCULAR SURGEON LEAD A TEAM THAT PROVIDES OPTIMAL CARE AND WHAT ARE ITS ADVANCED FEATURES

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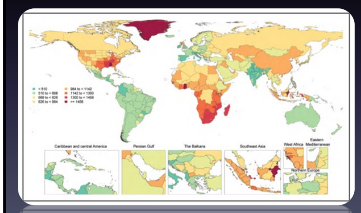
DISCLOSURE

No financial conflict of interest to disclose

BURDEN OF STROKE IN THE WORLD

Age-standardized global prevalence rates of ischemic stroke per 100000, both sexes, 2020



Each year, ≈795000 people experience a new or recurrent stroke

Of all strokes, 87% are ischemic, 10% are ICHs, and 3% are SAHs

In 2020 global incidence of stroke was 11.71 million people

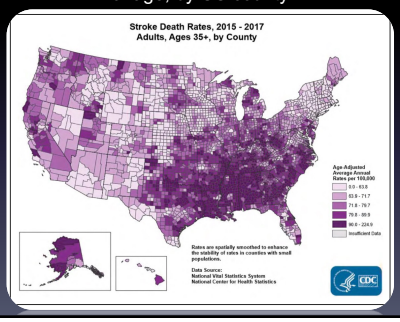
Ischemic stroke was 7.59 million

Deaths attributable to stroke were 7.08 million

Tsao et al. Circulation 2023

BURDEN OF STROKE IN USA

Stroke death rates, 2015 through 2017, among adults >35 years of age, by US county



STROKE TREATMENT NOWADAYS

AHA/ASA Guideline

Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

3.5.2. Time Windows	COR	LOE	New, Revised, or Unchanged
1. IV alteplase (0.9 mg/kg, maximum dose 90 mg over 60 minutes with initial 10% of dose given as bolus over 1 minute) is recommended for selected patients who can be treated within 3 hours of ischemic stroke symptom onset or patient last known well or at baseline state. Physicians should review the criteria outlined in Table 8 to determine patient eligibility.	I	A	Recommendation reworded for clarity from 2013 AIS Guidelines. COR and LOE unchanged. See Table XCV in online Data Supplement 1 for original wording.

3.5.2. Time Windows (Continued)	COR	LOE	New, Revised, or Unchanged
2. IV alteplase (0.9 mg/kg, maximum dose 90 mg over 60 minutes with initial 10% of dose given as bolus over 1 minute) is also recommended for selected patients who can be treated within 3 and 4.5 hours of ischemic stroke symptom onset or patient last known well or at baseline state. Physicians should review the criteria outlined in Table 8 to determine patient eligibility.	I	B-R	Recommendation reworded for clarity from 2013 AIS Guidelines. COR unchanged. LOE amended to conform with ACC/AHA 2015 Recommendation Classification System. See Table XCV in online Supplement 1 for ori...

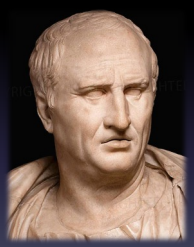
IVT

Mechanical Thrombectomy (MT or EVT)

What is the future of stroke treatment?

«Historia magistra vitae»

«Lessons for the future come from the past»



Marcus Tullius Cicero, De Oratore

HISTORY OF STROKE GUIDELINES

Sandorfer et al — 2021 Guideline for the Secondary Prevention of Ischemic Stro

Table 2. Associated AHA/ASA Guidelines and Statements

Title	Organization	Publication year
AHA/ASA guidelines		
Guidelines for Carotid Endarterectomy[24]	AHA/ASA	1998
Guideline on the Management of Patients With Extracranial Carotid and Vertebral Artery Disease[25]	ASA/ACCF/AHA/AANN/AANS/ACR/ASNR/CNS/SAIP/SCAI/SIR/SNIS/SVM/SVS	2011
Guideline on Lifestyle Management to Reduce Cardiovascular Risk[26]	AHA/ACC	2013
Guideline for the Management of Overweight and Obesity in Adults[27]	AHA/ACC/TOS	2013
Guideline for the Management of Patients With Atrial Fibrillation[28]	AHA/ACC/HRS	2014
Guidelines for the Management of Spontaneous Intracerebral Hemorrhage[17]	AHA/ASA	2014
Guidelines for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack[9]	AHA/ASA	2014
Guidelines for the Prevention of Stroke in Women[23]	AHA/ASA	2014
Guidelines for the Primary Prevention of Stroke[16]	AHA/ASA	2014
Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults[29]	ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA	2017
Guideline for the Management of Adults With Congenital Heart Disease[30]	AHA/ACC	2018
Guideline on the Management of Blood Cholesterol[31]	AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA	2018
Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke[18]	AHA/ASA	2019
Guideline on the Primary Prevention of Cardiovascular Disease[19]	ACC/AHA	2019
Focused Update of the 2014 AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation[32]	AHA/ACC/HRS	2019
Guideline for the Management of Patients With Valvular Heart Disease[20]	ACC/AHA	2020
Guideline for the Management of Patients With Peripheral Artery Disease[33]	AHA/ACC/SCAI	2020

STACI.IT — Surgical Treatment of Acute Cerebral Ischemia Italian Trial

CEA IN STROKE PATIENTS IN 2000

Inclusion criteria

- Clear time of onset of symptoms
- NIHSS score < 22
- Recent ischemic hemispheric brain infarct < 1/3 of the middle cerebral artery area regardless of BBB disruption at CT or MRI scans
- ICA stenosis ≥ 70% or ≥ 50% with an ulcerated surface plaque at US evaluation
- Patent middle cerebral artery in the detectable portion M1 and M2

Exclusion criteria

According to clinical presentation on admission

- Not clear time of onset of symptoms
- Severe neurological deficit (NIHSS score > 22)
- Cerebral ischemia onset with seizures
- Previous ischemic or hemorrhagic stroke with residual severe deficit (Modified Rankin Scale ≥ 2)
- History of cerebral haematomas
- Any other cerebral disease with residual permanent deficit

According to CT or MRI scans on admission

- Recent ischemic hemispheric brain infarct > 1/3 of the middle cerebral artery area
- Presence of cerebral haemorrhage
- Brain tumor — **2.5 cm**
- Cerebral arterio-venous malformation
- Cerebral aneurysm

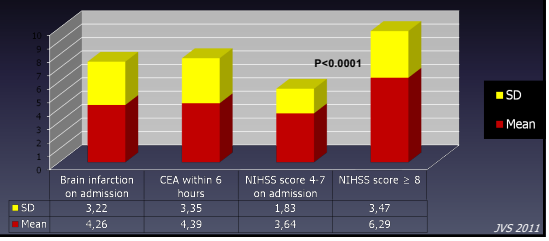
Urgent carotid endarterectomy to prevent recurrence and improve neurologic outcome in mild-to-moderate acute neurologic events

January 2005 – December 2009: **62 patients**

CEA performed between 2hours and 11 days (Mean 1.5d. ± 2.3d)

No perioperative neurologic mortality, no stroke recurrence, no hemorrhagic transformation

NIHSS score decrease ≥ 4 points in 45.1%



	Brain infarction on admission	CEA within 6 hours	NIHSS score 4-7 on admission	NIHSS score ≥ 8
SD	3,22	3,35	1,83	3,47
Mean	4,26	4,39	3,64	6,29

JVS 2011

The need for emergency surgical treatment in carotid-related stroke in evolution and crescendo transient ischemic attack

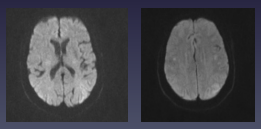
January 2005-December 2009 — **48 pts**

26 SIE ↑ NIHSS — **22 Ctia** NIHSS=0

CEAs were performed from 1 to 24 hours from onset of symptoms (mean 10.16±7.75).

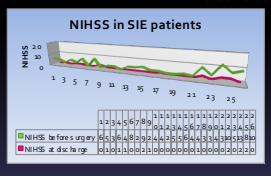
An ischemic brain lesion was detected in 25% of them.

1 SIE patient an hemorrhagic transformation of an undetected brain ischemic lesion progressive neurological deterioration in the following 24 hours and exitus (2%)



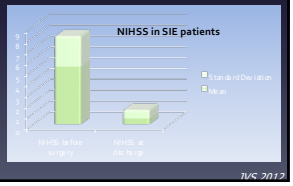
JVS 2012

EMERGENCY CEA IN SIE AND CTIA RESULTS



All cTIA patients presented a persistent NIHSS normal score before and after surgery.

Twenty-five SIE patients presented an NIHSS score improvement after surgery. Mean NIHSS score was 5.30±2.81 before surgery and 0.54±0.77 at discharge in the SIE group (p<0.0001).



JVS 2012

CEA IN ACUTE STROKE - AIMS

Stroke prevention

1. Removing a source of ongoing embolism
2. Preventing early progression towards thrombosis
3. Improving overall cerebral perfusion
4. Reducing cumulative neuronal loss by restoring blood flow to the ischemic penumbra

Stroke treatment

IVT can treat but not prevent recurrence

CAROTID REVASCULARIZATION IN STROKE PTS

HOW?

Editor's Choice – European Society for Vascular Surgery (ESVS) 2023 Clinical Practice Guidelines on the Management of Atherosclerotic Carotid and Vertebral Artery Disease

Table 28 Thirty day outcomes following carotid artery stenting (CAS) *versus* carotid endarterectomy (CEA), stratified for timing after symptom onset in a meta-analysis of symptomatic patients randomised in Carotid Revascularization versus Stenting Trial (CREST), The International Carotid Stenting Study (ICSS), Endarterectomy versus Stenting in patients with Symptomatic Severe carotid Stenosis (EVA-3S), and Stent Protected Angioplasty versus Carotid Endarterectomy (SPACE)

	30 day outcomes		OR (95% CI)	*p* value
	CEA	CAS		
Any stroke or death				
≤7 days	3 / 226 (1.3)	24 / 287 (8.4)	6.51 (2.00–21.21)	.002
>7 days	65 / 1 819 (3.6)	129 / 1 806 (7.1)	2.00 (1.49–2.67)	<.001
Any stroke				
≤7 days	3 / 226 (1.3)	23 / 287 (8.0)	6.27 (1.92–20.44)	.002
>7days	62 / 1 819 (3.4)	122 / 1 806 (6.8)	1.98 (1.47–2.67)	<.001
Fatal or disabling stroke				
≤7 days	1 / 226 (0.4)	9 / 287 (3.1)	8.29 (1.07–64.28)	.04
>7 days	26 / 1 819 (1.4)	46 / 1 806 (2.5)	1.77 (1.10–2.85)	.02

Data are presented as *n* (%). CEA = carotid endarterectomy; CAS = carotid artery stenting; OR = odds ratio; CI = confidence interval.
* Based on data from Rantner *et al.*[170]

Recommendation 45 — **Unchanged**

For patients who are undergoing revascularisation within the first 14 days after onset of symptoms, it is recommended that they should undergo carotid endarterectomy, rather than carotid stenting.

Class	Level	References	ToE
I	A	Rantner *et al.* (2017)[170], Rantner *et al.* (2013)[384]	

ESVS carotid guidelines Naylor et al. EJVES 2023

CURRENT EVIDENCE

SOCIETY FOR VASCULAR SURGERY DOCUMENT

Check for updates

The Society for Vascular Surgery implementation document for management of extracranial cerebrovascular disease

Summary and recommendations

1. *Transfemoral CAS should be performed with distal or proximal protection devices.*
2. *There is no evidence of superiority of one DEP device vs the others.*
3. *There is some evidence that proximal protection offers advantage over DEP by avoiding unprotected lesion crossing.*
4. *TCAR with cerebral flow reversal had the lowest reported stroke rate to date compared to all transfemoral CAS studies.*

Avoiding the arch + inverting the flow

AbuRahma et al. SVS guidelines JVS 2022

MESH-COVERED STENT PLAQUE COVERAGE

Conventional Stent

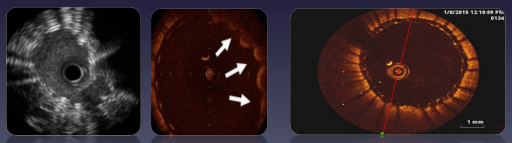
No plaque coverage below stent

- Thrombus, plaque ruptures or aneurysms remains uncovered
- Post-dilatation may cause thrombus migration

Mesh-covered Stent

Designed for **plaque coverage** below stent

- The mesh **permanently cover** thrombus, the plaque ruptured and folds possible aneurysms
- Mesh will defend from thrombus migration in case of **post-dilatation**



Endovascular Therapy of Anterior Circulation Tandem Occlusions

Pooled Analysis From the TITAN and ETIS Registries

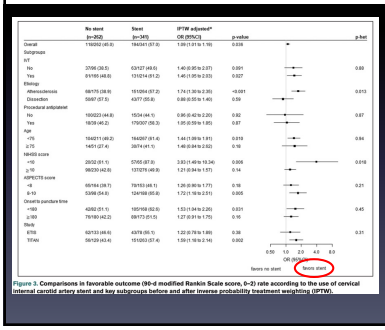


Figure 3. Comparisons in favorable outcome (90-d modified Rankin Scale score, 0–2) rate according to the use of cervical internal carotid artery stent and key subgroups before and after inverse probability treatment weighting (IPTW).

CAS favourable outcomes in pts with intracranial and carotid >90% stenosis/ occlusion

Anadani et al. Stroke 2021

Vascular surgeons have been historically involved in brain Tx

Brain vasculature is their next step

Why should vascular surgeons become involved in intracranial endovascular treatments?

Can their involvement be beneficial to patients?

Learn to manage eventual complications of carotid revascularization procedures by brain rescue

Direct common carotid access in difficult access procedures

Direct puncture of the carotid artery as a bailout vascular access technique for mechanical thrombectomy in acute ischemic stroke—the revival of an old technique in a modern setting

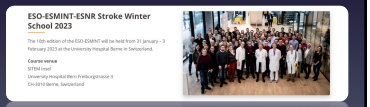
Miszczuk M et al. Neuroradiology 2021

STROKE TREATMENT

***How** can vascular surgeons become involved in intracranial endovascular treatments?*

Training courses

On-line and in-person
Theoretical and «hands-on»



Certifications!

Training Standards in Neuroendovascular Surgery
Program Accreditation and Practitioner Certification

Arthur L. Day, MD; Adnan H. Siddiqui, MD, PhD; Philip M. Meyers, MD; Tudor G. Jovin, MD; Colin P. Derdeyn, MD; Brian L. Hoh, MD; Howard Riina, MD; Italo Linfante, MD; Osama Zaidat, MD; Aquilla Turk, DO; Jay U. Howington, MD; J. Mocco, MD, MS; Andrew J. Ringer, MD; Erol Veznedaroglu, MD; Alexander A. Khalessi, MD, MS; Elad I. Levy, MD, MBA; Henry Woo, MD; Robert Harbaugh, MD; Steven Giannotta, MD

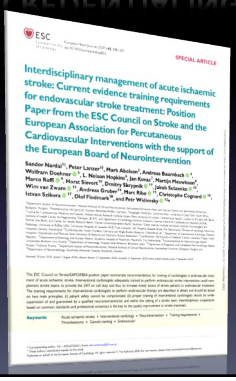
Requirements for CAST NES Training Program Accreditation

Each program should perform at least 250 therapeutic NES procedures per year, including a minimum number of core cases that comprise:
- 40 aneurysm treatments, including 10 presenting with rupture
- 20 intracranial embolizations (arteriovenous malformation, arteriovenous fistula, tumor)
- 25 intracranial or extracranial stent placements (at least 5 in each category and may include stents or flow diverters for aneurysms)
- 30 acute ischemic stroke treatments
- 10 intracranial infusions (eg, vasospasm, chemotherapy, and stroke)
- 10 extracranial embolizations
- 5 spinal angiograms and embolizations

Applicants for Practice Track certification must satisfy most or all of the following conditions:
- Neurosurgery/neurology/radiology residency (ACGME accredited or equivalent)

Day et al. Stroke 2017

CREDENTIALING REQUIREMENTS



Interdisciplinary management of acute ischaemic stroke: Current evidence training requirements for endovascular stroke treatment: Position Paper from the ESC Council on Stroke and the European Association for Percutaneous Cardiovascular Interventions with the support of the European Board of Neurointervention

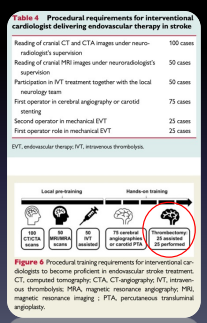


Table 4 Procedural requirements for interventional cardiologist delivering endovascular therapy in stroke

Reading of cranial CT and CTA images under neuroradiologist's supervision	100 cases
Reading of cranial MRI images under neuroradiologist's supervision	50 cases
Participation in IVT treatment together with the local neurology team	50 cases
First operator in cerebral angiography or carotid stenting	75 cases
Second operator in mechanical EVT	25 cases
First operator role in mechanical EVT	25 cases

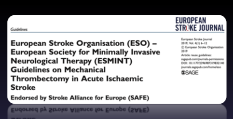
EVT, endovascular therapy; IVT, intravenous thrombolysis.

Figure 6 Procedural training requirements for interventional cardiologists to become proficient in endovascular stroke treatment. CT, computed tomography; CTA, CT-angiography; IVT, intravenous thrombolysis; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging ; PTA, percutaneous transluminal angioplasty.

Nardai S et al, Eur Heart J 2021

STROKE TREATMENT ACCREDITATION AND CERTIFICATION

ESMINT
European Society of Minimally Invasive Neurological Therapy



Standards for European training requirements in interventional neuroradiology

Guidelines by the Division of Neuroradiology/Section of Radiology European Union of Medical Specialists (UEMS), in cooperation with the Division of Interventional Radiology/UEMS, the European Society of Neuroradiology (ESNR), and the European Society of Minimally Invasive Neurological Therapy (ESMINT)

Turc G et al. Eur Stroke J 2019
Sasiadek M et al. Neuroradiology 2019

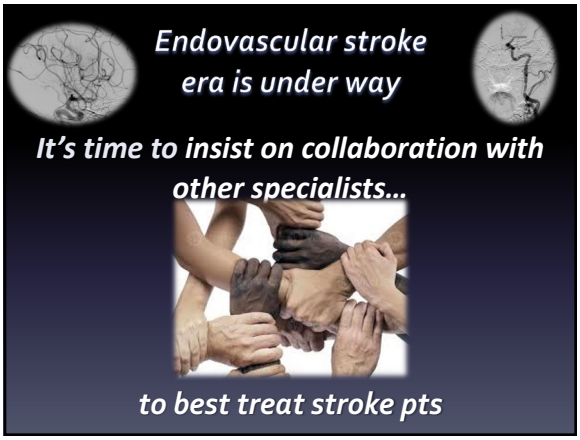
CONCLUSIONS

At the beginning of the endovascular era, vascular surgeon started a close collaboration with interventionalists to acquire endo competencies

Today it's possible for vascular surgeons/specialists to acquire specific competencies and certifications in new devices and techniques for brain vessels treatment

Increase in endovascular Tx of carotid disease is expected since new techniques (TC- CAS), devices (mesh-covered stents) and adjuncts (flow-reversal PDs) are available nowadays


How do you imagine
carotid treatment
in the
future?


Endovascular stroke
era is under way
It's time to insist on collaboration with
other specialists…
to best treat stroke pts


Thanks for your attention