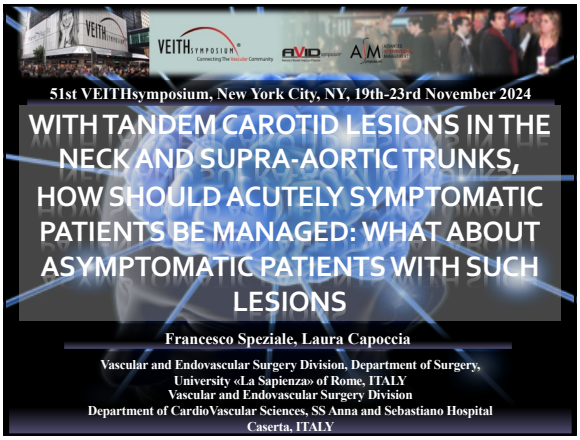


51st VEITHsymposium, New York City, NY, 19th-23rd November 2024

# WITH TANDEM CAROTID LESIONS IN THE NECK AND SUPRA-AORTIC TRUNKS, HOW SHOULD ACUTELY SYMPTOMATIC PATIENTS BE MANAGED: WHAT ABOUT ASYMPTOMATIC PATIENTS WITH SUCH LESIONS

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## DISCLOSURE

No financial conflict of interest to disclose

## TANDEM (EXTRA AND INTRACRANIAL) LESIONS

- Asymptomatic (rare)
- Symptomatic

Stroke pts

MR CLEAN (the Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands) 32.3%
REVASCAT (Revascularization With Solitaire FR Device Versus Best Medical Therapy in Anterior Circulation Stroke Within 8 Hours of Symptom Onset) 18.6%
ESCAPE (Endovascular Treatment for Small Core and Proximal Occlusion Ischemic Stroke) 19%

*Jadhav et al. Stroke 2019*

AHA/ASA GUIDELINE

## 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack

A Guideline From the American Heart Association/American Stroke Association

*5.1.3. Aortic Arch Atherosclerosis*

**Recommendations for Aortic Arch Atherosclerosis**
**Referenced studies that support recommendations are summarized in online Data Supplement 28.**

| COR | LOE | Recommendations |
|---|---|---|
| 1 | B-R | 1. In patients with a stroke or TIA and evidence of an aortic arch atheroma, intensive lipid management to an LDL cholesterol target <70 mg/dL is recommended to prevent recurrent stroke.[210] |
| 1 | C-LD | 2. In patients with a stroke or TIA and evidence of an aortic arch atheroma, antiplatelet therapy is recommended to prevent recurrent stroke.[380–385] |

*Kleindorfer et al. Stroke 2021*

## STROKE TREATMENT

**Since publication in 2015 of Mechanical Thrombectomy (MT) Trials and acquisition of these new information in guidelines,**

**stroke treatment has dramatically changed worldwide**

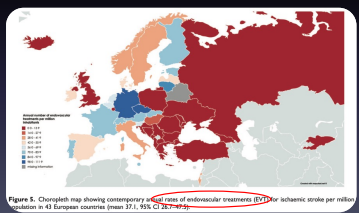


Figure 5. Choropleth map showing contemporary annual rates of endovascular treatments (EVT) for ischaemic stroke per million population in 43 European countries (mean 37.1, 95% CI 28.7–47.5).

Data demonstrated high variability in access to EVT for stroke pts in different areas

*Even in European countries, only 7.3% of all patients with acute ischaemic stroke receive intravenous thrombolysis and only 1.9% receive endovascular treatment, with the highest country-level rates being 20.6% for intravenous thrombolysis (in the Netherlands) and 4.3% for endovascular treatment (in Malta).*

*Aguiar de Sousa D et al. Eur Stroke J 2019*

## STROKE TREATMENT

**The state of stroke services across the globe: Report of World Stroke Organization–World Health Organization surveys**

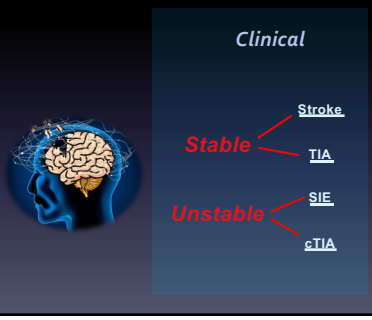
Figure 2.
Quintiles of performance by presence of stroke prevention activities – secondary stroke prevention activities.

Figure 3.
Quintiles of performance by presence of acute stroke services.

*Owolabi MO et al. Int J Stroke 2021*

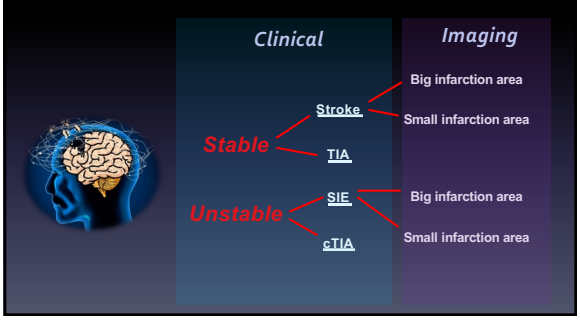
# STROKE PATIENTS

*Carotid-related neurological event(s)*




# STROKE PATIENTS

*Carotid-related neurological event(s)*




CLINICAL PRACTICE GUIDELINE DOCUMENT

European Society for Vascular Surgery (ESVS) 2023 Clinical Practice Guidelines on the Management of Atherosclerotic Carotid and Vertebral Artery Disease☆

Ross Naylor [a,*], Barbara Rantner [b], Stefano Ancetti [c], Gert J. de Borst [d], Marco De Carlo [e], Alison Halliday [f], Stavros K. Kakkos [g], Hugh S. Markus [h], Dominick J.H. McCabe [i], Henrik Sillesen [j], Jos C. van den Berg [k], Melina Vega de Ceniga [l], Maarit A. Venermo [m], Frank E.G. Vermassen [n]

| Recommendation 44 | | | Unchanged |
|---|---|---|---|
| For symptomatic patients with a 50–99% stenosis in whom a carotid intervention is considered appropriate, it is recommended that this be performed as soon as possible, preferably within 14 days of symptom onset. | | | |
| Class | Level | References | ToE |
| I | A | Rothwell *et al.* (2004)[158], Rothwell *et al.* (2004)[159] | |

| Recommendation 47 | | | Unchanged |
|---|---|---|---|
| For patients with 50–99% stenoses who present with stroke in evolution or crescendo transient ischaemic attacks, urgent carotid endarterectomy should be considered, preferably within 24 hours. | | | |
| Class | Level | References | ToE |
| IIa | C | Munster *et al.* (2015)[81], Rerkasem *et al.* (2009)[232], Capoccia *et al.* (2012)[393], Gajin *et al.* (2014)[394] | |

Operate within 14 days

24 hours if fluctuating symptoms

ESVS carotid guidelines Naylor et al. EJVES 2023

# CAROTID REVASCULARIZATION IN STROKE PTS

| Recommendation 46 | | | Unchanged |
|---|---|---|---|
| For patients with 50–99% stenoses who experience a disabling stroke (modified Rankin score ≥3), or whose area of infarction exceeds one third of the ipsilateral middle cerebral artery territory, or who have altered consciousness/ drowsiness, it is recommended to defer carotid interventions to minimise the risks of post-operative parenchymal haemorrhage. | | | |
| Class | Level | References | ToE |
| I | C | Rantner *et al.* (2006)[388], Wolfe *et al.* (2004)[389] | |

Disabling stroke (mRS>3)
>1/3 MCA territory
Altered consciousness

NO TX

ESVS carotid guidelines Naylor et al. EJVES 2023

# CAROTID REVASCULARIZATION IN STROKE PTS

*HOW?*


CLINICAL PRACTICE GUIDELINE DOCUMENT

European Society for Vascular Surgery (ESVS) 2023 Clinical Practice Guidelines on the Management of Atherosclerotic Carotid and Vertebral Artery Disease☆

Ross Naylor [a,*], Barbara Rantner [b], Stefano Ancetti [c], Gert J. de Borst [d], Marco De Carlo [e], Alison Halliday [f], Stavros K. Kakkos [g], Hugh S. Markus [h], Dominick J.H. McCabe [i], Henrik Sillesen [j], Jos C. van den Berg [k], Melina Vega de Ceniga [l], Maarit A. Venermo [m], Frank E.G. Vermassen [n]

| 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] | |

*CEA is better…*

ESVS carotid guidelines Naylor et al. EJVES 2023

# TANDEM OCCLUSION/STENOSIS IN STROKE TREATMENT

Consensus for synchronous CAS in MT in presence of…

| Recommendation 51 | | New |
|---|---|---|
| For a patient with acute ischaemic stroke undergoing intracranial mechanical thrombectomy with a tandem 50–99% carotid stenosis and a small area of ipsilateral infarction, synchronous carotid stenting may be considered in the presence of poor antegrade internal carotid artery flow or poor collateralisation via the circle of Willis after mechanical thrombectomy. | | |
| Class | Level | References |
| IIb | C | Consensus |

ESVS carotid guidelines Nicolini et al. EJVES 2022

## #Stroke patient admitted to Emergency Department

- Female
- 72 years old
- Neurological deficit occurring 2 hours before hospital admission
- NIHSS on admission 18
- No bleeding risk in medical Hx
- Brain CT → no hemorrhage, ASPECT 6, ACM hyperdensity

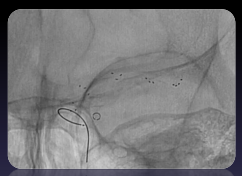
## #Stroke patient admitted to Emergency Department

IVT was promptly started

**Neuroradiologist alerted…**

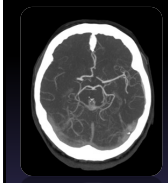
Patient transferred to neuroangiosuite for Mechanical Thrombectomy (MT or EVT)


# STROKE PTS WITH TANDEM LESIONS



Vascular Surgeon alerted because of a patient with M1 occlusion and very irregular carotid plaque on angiogram

# STROKE PTS WITH M1 OCCLUSION AND IRREGULAR CAROTID PLAQUE



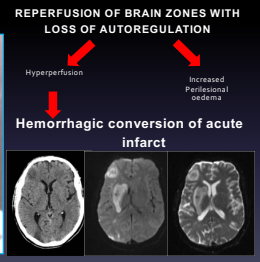
***What to do next?***

Emergency CEA
Concurrent/emergency CAS
Delayed CEA……WHEN?
Delayed CAS…….WHEN?

*Issues to consider*

Pt was under rtPA → clearance?
NIHSS was severely compromised
No advanced brain imaging

# *What is the adjunctive risk in very early CEA?*



# ICH OCCURRENCE

- rtPA (short half-life, prolonged effect)
- Antiplatelet therapy
- Reperfusion injury after CEA


## A Systematic Review and Meta-analysis of Peri-Procedural Outcomes in Patients Undergoing Carotid Interventions Following Thrombolysis

Stavros K. Kakkos [a,*], Melina Vega de Ceniga [b], Ross Naylor [c]
[a] Department of Vascular Surgery, University Hospital of Patras, Patras, Greece
[b] Department of Angiology and Vascular Surgery, Hospital de Galdakao-Usansolo, Galdakao and Biocruces Bizkaia Health Research Institute, Barakaldo, Spain
[c] Leicester Vascular Institute, Glenfield Hospital, Leicester, UK

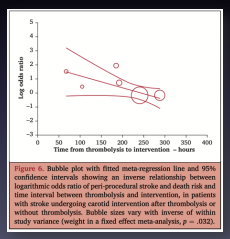



Figure 6. Bubble plot with fitted meta-regression line and 95% confidence intervals showing an inverse relationship between logarithmic odds ratio of peri-procedural stroke and death risk and time interval between thrombolysis and intervention, in patients with stroke undergoing carotid intervention after thrombolysis or without thrombolysis. Bubble sizes vary with inverse of within study variance (weight in a fixed effect meta-analysis, $p = .032$).

| Recommendation 49 | | | New |
|---|---|---|---|
| For patients with acute ischaemic stroke due to a symptomatic 50–99% carotid stenosis who have received intravenous thrombolysis, delaying carotid endarterectomy or carotid stenting by six days following completion of thrombolysis should be considered. | | | |
| Class | Level | References | ToE |
| IIa | B | Kakkos *et al.* (2021)[96]; Vellimana *et al.* (2018)[157] | |

According to guidelines carotid revascularization should be delayed in pts submitted to IVT

*Kakkos et al. EJVES 2021*
*ESVS carotid guidelines Naylor et al. EJVES 2023*

Eur J Vasc Endovasc Surg (2014) 48, 505–512

REVIEW

## Safety of Carotid Intervention Following Thrombolysis in Acute Ischaemic Stroke

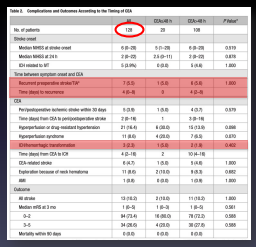
R. Mandavia *, M.I. Qureshi, B. Dharmarajah, K. Head, A.H. Davies

| | N studies | N patients | 30-day stroke&death | ICH |
|---|---|---|---|---|
| Mandavia 2014 | 9 | 114 | 4 (4.93%) | 2*° |

*CEA 33 h after IVT
° CEA 12 days after IVT

## Prior Intravenous Stroke Thrombolysis Does Not Increase Complications of Carotid Endarterectomy

Petra Ijäs, MD, PhD, MSc; Ellinoora Aro, MD, PhD; Henrietta Eriksson, MD; Pirkka Vikatmaa, MD, PhD; Lauri Soinne, MD, PhD; Maarit Venermo, MD, PhD



*«We found no association between the time from IVT to CEA and CEA-related complications. Furthermore, the complication risk of the IVT-CEA patients was not increased com- pared with patients who underwent CEA alone. On the other hand, there were several recurrent strokes during the first week after stroke onset in the patients waiting for CEA.»*

How many strokes occurr WHILE WAITING for delayed carotid revascularization?

*Ilas et al. Stroke 2018*

# TANDEM OCCLUSION/STENOSIS IN STROKE TREATMENT

Despite some uncertainty, based on the available evidence, the American Heart Association/American Stroke Association considered the treatment of cervical ICA during EVT as reasonable (level IIb evidence)

| 8. Treatment of tandem occlusions (both extracranial and intracranial occlusions) when performing mechanical thrombectomy may be reasonable. | IIb | B-R |
|---|---|---|

Tandem occlusions were included in recent endovascular trials that showed benefit of mechanical thrombectomy over medical management alone. In the HERMES meta-analysis, 122 of 1254 tandem occlusions (RR, 1.81 [95% CI, 0.96–3.4]) and 1132 of 1254 nontandem occlusions (RR, 1.71 [95% CI, 1.40–2.09]) were reported compared with medical management.[38] In THRACE, 24 of 196 tandem occlusions (RR, 1.82 [95% CI, 0.55–6.07]) and 172 of 196 nontandem occlusions (RR, 1.34 [95% CI, 0.87–2.07]) were treated compared with IV alteplase alone.[39] In HERMES, there is heterogeneity of treatment methods directed to the proximal extracranial carotid occlusion (no revascularization of the proximal lesion versus angioplasty versus stenting). A retrospective analysis of pooled data from 18 centers examined 395 patients with AIS caused by tandem lesion of the anterior circulation who underwent mechanical thrombectomy (TITAN [Thrombectomy in Tandem Lesions]). mTICI grade 2b/3 was achieved in 76.7% of patients. At 90 days, 52.2% achieved an mRS score of 0 to 2, 13.8% had parenchymal hematoma, and 13.2% were dead.[40] Multiple retrospective reports detail the technical success of mechanical thrombectomy for tandem occlusions but do not provide specifics on comparative approaches. No conclusions about the optimum treatment approach for patients with tandem occlusions are therefore possible.

*Powers et al. Stroke 2019*

# *How did it end?*

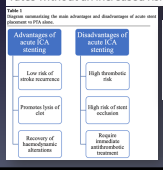
Original Investigation | Neurology

**Functional and Safety Outcomes of Carotid Artery Stenting and Mechanical Thrombectomy for Large Vessel Occlusion Ischemic Stroke With Tandem Lesions**

**DESIGN, SETTING, AND PARTICIPANTS** This cross-sectional study included consecutive patients with acute anterior circulation TLs admitted across 17 stroke centers in the US and Spain between January 1, 2015, and December 31, 2020. Data analysis was performed from August 2021 to February

**RESULTS** Of 685 patients, 623 (mean [SD] age, 67 [12.2] years; 406 [65.2%] male) were included in the analysis, of whom 363 (58.4%) were in the CAS group and 260 (41.6%) were in the nonstenting group. The CAS group had a lower proportion of patients with atrial fibrillation (38 [10.6%] vs 49

**CONCLUSIONS AND RELEVANCE** In this multicenter, international cross-sectional study, CAS of the cervical lesion during MT was associated with improvement in functional outcomes and reperfusion rates without an increased risk of sICH and mortality in patients with TLs.




Diagnosis and management of *tandem* occlusion in acute ischemic stroke

Antonio Di Donna [a], Gianluca Muto [a], Flavio Giordano [a], Massimo Muto [a], Gianluigi Guarnieri [a], Giovanna Servillo [b], Antonio De Mase [b], Emanuele Spina [b], Giuseppe Leone [b,*]

[a] Unit of Interventional Neuroradiology, Department of Advanced Diagnostic and Therapeutic Technologies, A.O.R.N. Antonio Cardarelli Hospital, Via Cardarelli 1, Naples 80131, Italy
[b] Unit of Neurology and Stroke Unit, Department of Emergency and Acceptance, A.O.R.N. Antonio Cardarelli Hospital, Via Cardarelli 1, Naples 80131, Italy
[c] Division of Diagnostic and Interventional Neuroradiology, Geneva University Hospitals, 1205 Geneva, Switzerland

*Farooqui JAMA Network Open 2023*
*Di Donna Eur J Radiol Open 2023*

# URGENT STROKE TREATMENT BY CAS…

## …is still a vascular surgeons' matter?

# KEY POINTS FOR CAS SUCCESS

- ✓Adjuvant medical therapy
- ✓Access route
- ✓Stent design
- ✓Pre and post-dilation
- ✓Cerebral protection device
- ✓Hospital/operator volumes and experience


# STENT DESIGN

*Systematic Review*

**Clinical Outcomes of Second- versus First-Generation Carotid Stents: A Systematic Review and Meta-Analysis**

Adam Mazurek [1,*], Krzysztof Malinowski [2], Kenneth Rosenfield [3], Laura Capoccia [4], Francesco Speziale [4], Gianmarco de Donato [5], Carlo Setacci [5], Christian Wissgott [6], Pasqualino Sirignano [4], Lukasz Tekieli [7], Andrey Karpenko [8], Waclaw Kuczmik [9], Eugenio Stabile [10], David Christopher Metzger [11], Max Amor [12], Adnan H. Siddiqui [13], Antonio Micari [14], Piotr Pieniążek [1,7], Alberto Cremonesi [15], Joachim Schofer [16], Andrej Schmidt [17] and Piotr Musialek [1,*,†] on behalf of CARMEN (CArotid Revascularization Systematic Reviews and MEta-aNalyses) Investigators

Table 2. The 30-day and 12-month event rates by stent type (random-effect model).

| | PGS | SGS | Casper Roadsaver | Gore | CGuard |
|---|---|---|---|---|---|
| 30-day Stroke (%) (95% CI) | 3.01 (2.63–3.38) | 0.68 (0.38–0.92) | 0.50 (0–1.15) | 2.09 (1.03–4.76) | 0.54 (0.17–0.92) |
| 30-day Death/Stroke/MI (%) (95% CI) | 4.11 (3.65–4.56) | 1.38 (0.64–1.96) | 1.33 (0–2.66) | 4.82 | 1.08 |
| 12-mo Ipsilateral Stroke (%) (95% CI) | 3.51 (2.52–4.50) | 0.7 (0–1.67) | 0.26 (0–1.27) | | |
| 12-mo Restenosis (%) (95% CI) | 3.97 (0.28–5.14) | 3.38 (1.38–5.37) | 7.16 (5.45–9.06) | | |
| 12-mo Ipsilateral Stroke/Restenosis (%) (95% CI) | 8.15 (6.63–9.96) | 5.12 (3.14–6.10) | 7.96 (5.04–10.68) | | |

*Mazurek A, Musialek P, et al. J Clin Med 2022*

**Transcervical Carotid Stenting With Dynamic Flow Reversal Demonstrates Embolization Rates Comparable to Carotid Endarterectomy**

Journal of Endovascular Therapy 1–6

DOI: 10.1177/1526602815626561
www.jevt.org
SAGE

Maarten Plessers, MSc[1,2], Isabelle Van Herzeele, MD, PhD[2], Dimitri Hemelsoet, MD[3], Nikil Patel, PhD[4], Emma M. L. Chung, PhD[4], Guy Vingerhoets, PhD[1], and Frank Vermassen, MD, PhD[2]

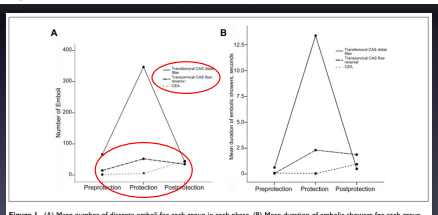



Figure 1. (A) Mean number of discrete emboli for each group in each phase. (B) Mean duration of embolic showers for each group in each phase.

*Plesser et al. J Endovasc Surg 2016*

# CONCLUSIONS

According to guidelines (based on syst rev of RCTs) a symptomatic carotid plaque should be best treated by CEA

Nevertheless, common practice is that tandem (intra and extracranial) lesions are being treated simultaneously by MT and CAS

Carotid revascularization in tandem lesions represents a "meeting point" for different specialties (neurology, neuroradiology, vascular surgery) and an issue to work on together to possibly develop unified guidelines

Stroke EVT is becoming more and more widespread and more stroke specialists will be needed in the near future


TEAM-WORK IS OF THE ESSENCE
Neurologist
Vascular surgeon
Cardiologist
Radiologist
Neurointerventionalist


Thanks for your attention