



Carotid Web in Stroke

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Disclosures

Grant (TKI-PPP grant)

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Grant

Nicolab b.v.

Health Holland Topsector LSH

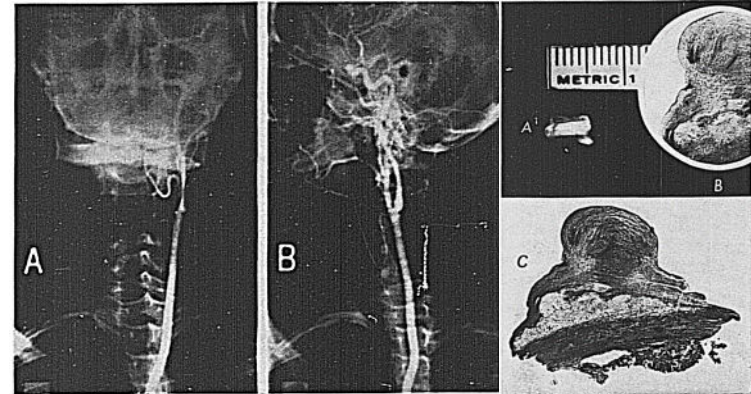
Leading The Change/ZonMw

All paid to institution.



Carotid Web

- Shelf-like protusion posterior wall ICA
- First histopathology in 1968
- Potential cause cryptogenic stroke
 - Young patients
 - No vascular risk factors



Rainer et al. Ann Surg. 1968

Mac Grory, et al. J Neurol Neurosurg Psychiatry 2020

Nomenclature Carotid Web

- Carotid weblike formations or septums
- Carotid pseudovalvular folds
- Carotid shelves
- Carotid diaphragms
- Thrombotic carotid megabulbs

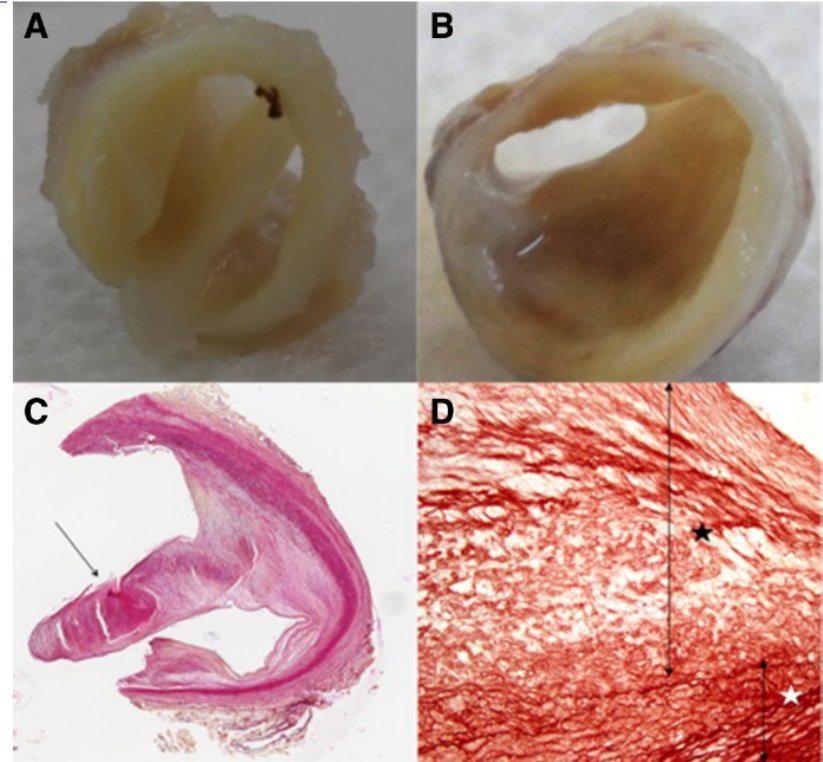
Kim et al. JAMA Neurology 2019





Histopathology

- Intimal hyperplasia
- No calcifications
- Tunica Media only minimally involved
- No infiltrate



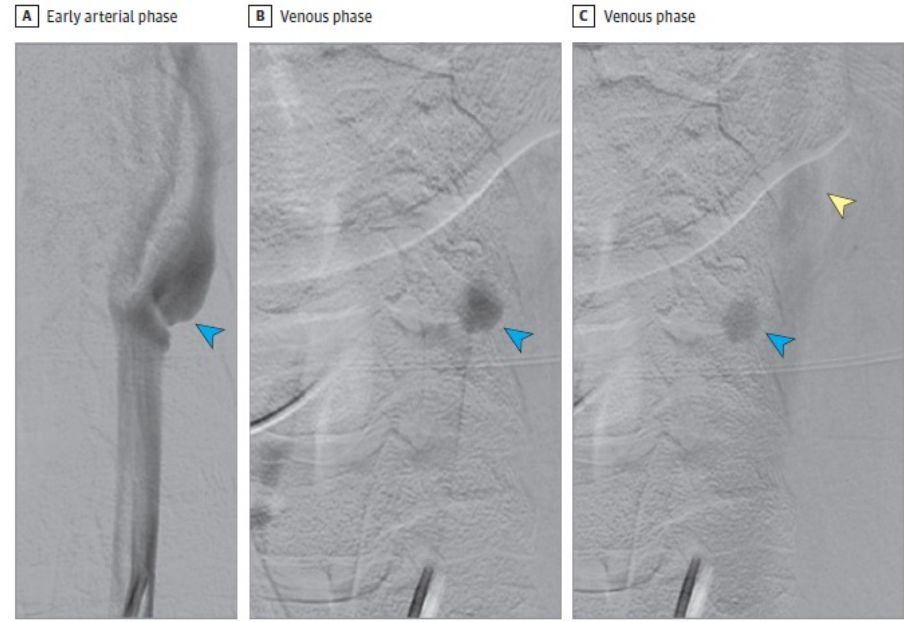
Joux et al .Stroke 2014



Imaging Carotid Web

- CT Angiography:
 - allows for 3D reconstructions
- DSA:
 - stasis visualization
 - AP & lateral views limit sensitivity
- Magnetic Resonance Angiography:
 - overestimation stenosis
- Ultrasound:
 - operator dependent

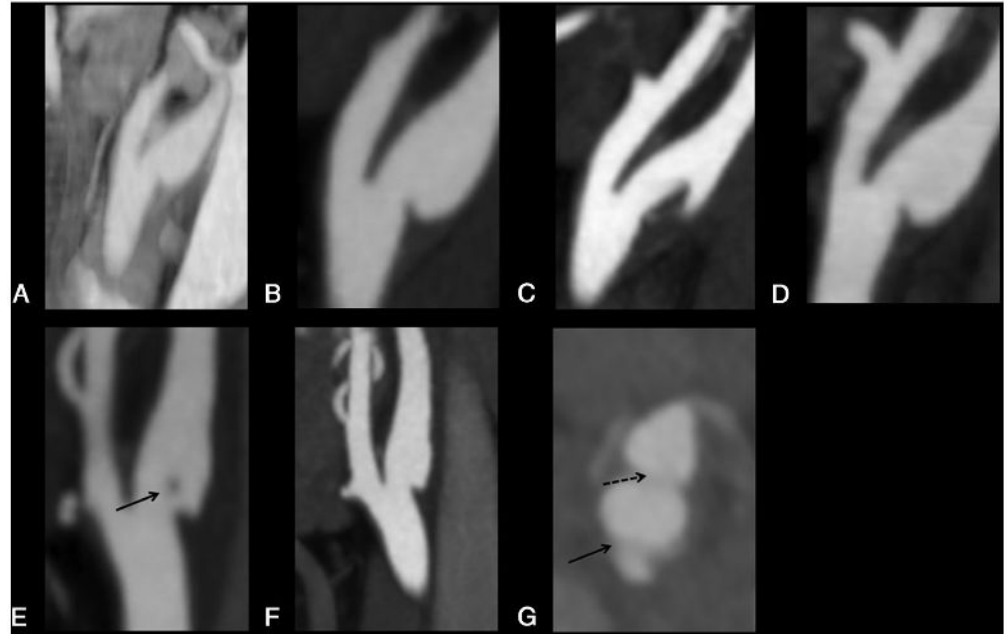
Figure 3. Example of Prolonged Contrast Stasis in the Carotid Bulb Pocket





Definition Carotid Web

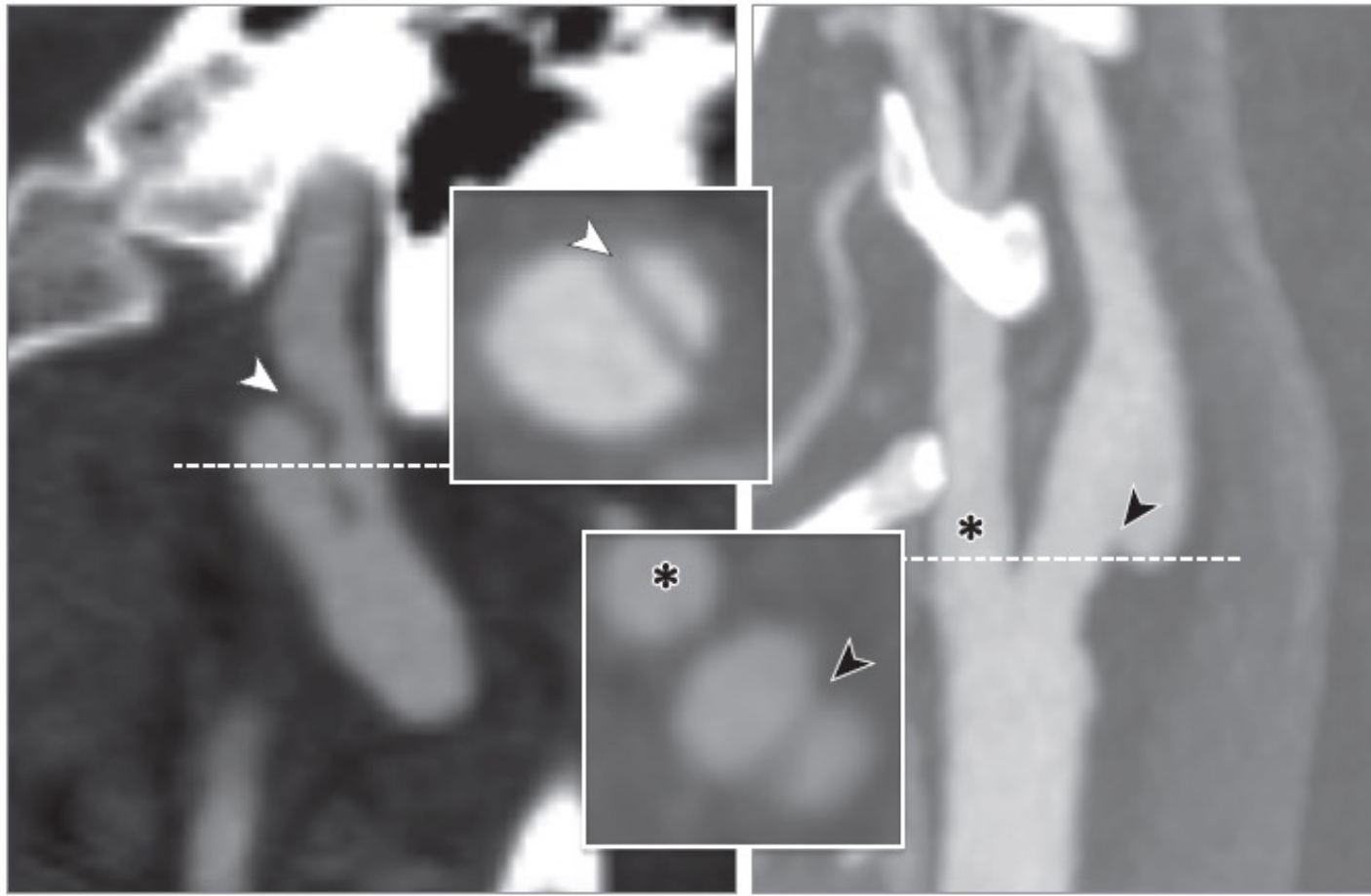
- thin intraluminal filling defect along posterior wall of carotid bulb
- just beyond carotid bifurcation on sagittal CTA
- seen as septum on axial CTA



Choi et al. AJNR 2015

A Distal internal carotid artery dissection

B Mimicked dissection



De

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Carotid Web Diagnosis

Table 1 Imaging characteristics of carotid webs compared with common radiographic mimics

	Carotid web	Atherosclerosis	Arterial dissection	Intraluminal thrombus
Stenosis	Rarely	Can cause stenosis or occlusion	Can cause stenosis or occlusion	Can cause stenosis or occlusion
Location	Arising from posterior wall of proximal ICA	At sites of maximum turbulence	Proximal ICA, can propagate distally	Can arise anywhere in extracranial or intracranial circulation
Morphology	Shelf-like, regular. Can be irregular if there is superimposed thrombus.	Irregular	Irregular, can have a 'spiral' appearance	Irregular, can have free-floating components
Calcium	No	Frequently present	No	No
Temporality	Does not change with time (unless there is superimposed thrombus)	Can progress or regress	Resolves with time	Resolves with time
Other	Can be bilateral	Evidence of atherosclerosis elsewhere in cervical and intracranial circulation	Presence of true and false lumen	Likely to change in appearance in the order of hours to days

ICA, internal carotid artery.

Mac Grory, et al. J Neurol Neurosurg Psychiatry 2020



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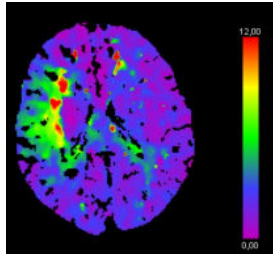
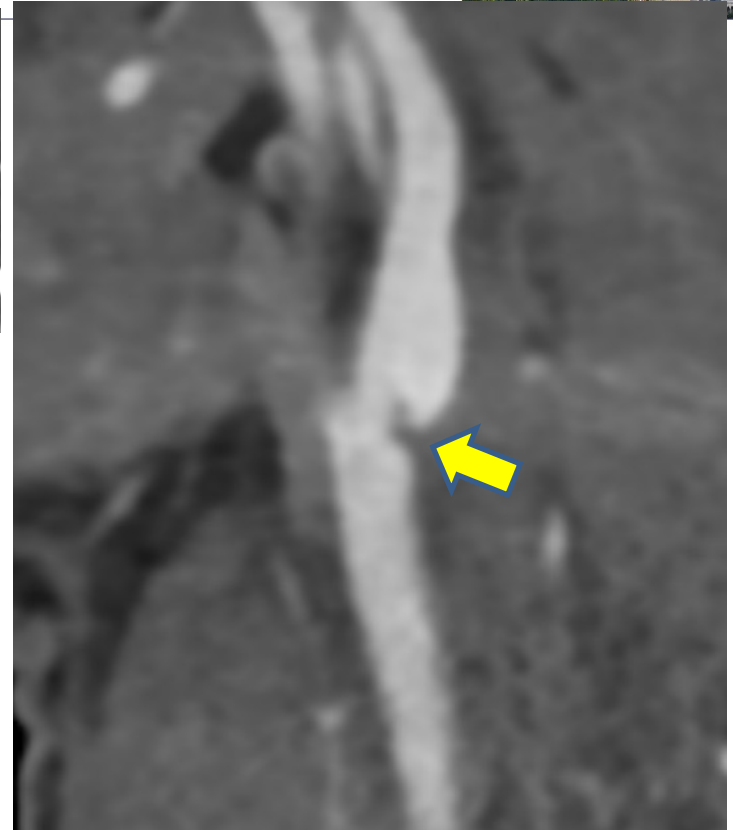
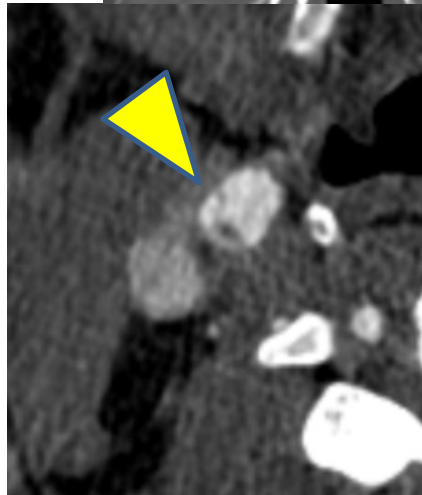
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Mac Grory, et al. J Neurol Neurosurg Psychiatry 2020



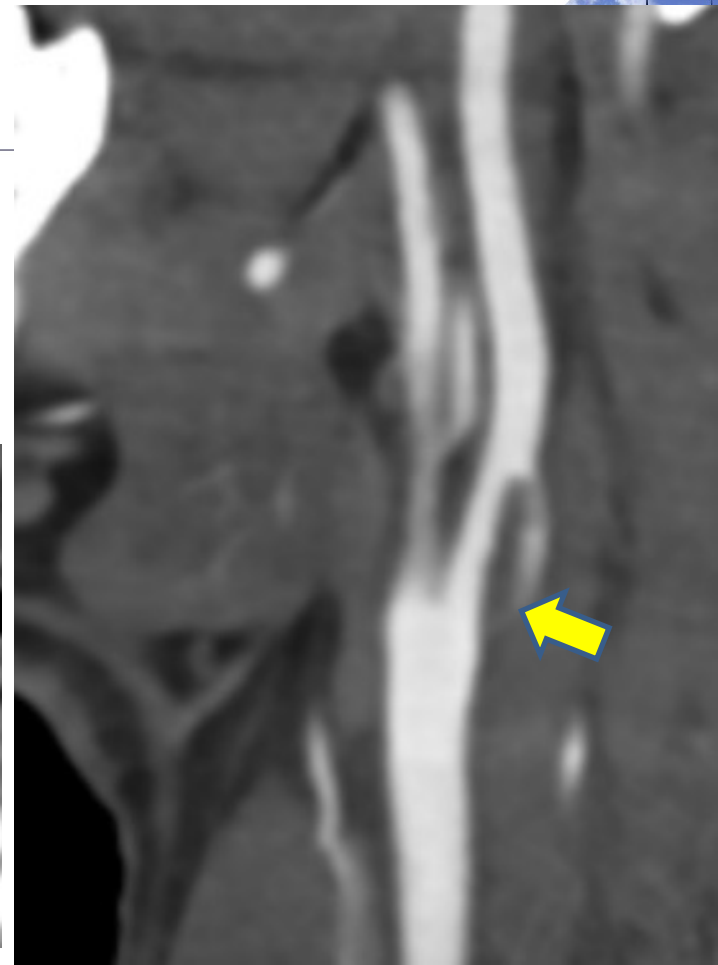
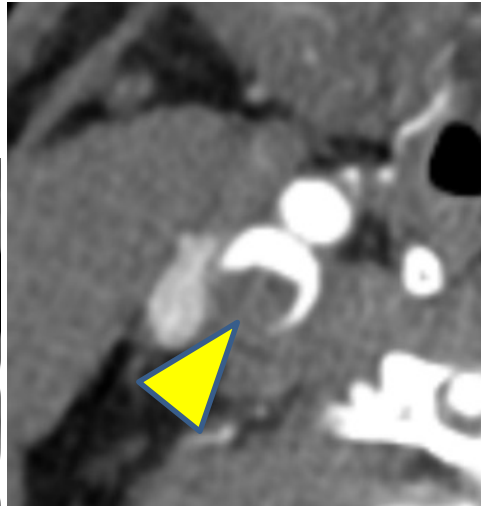
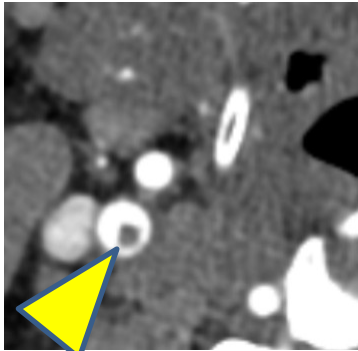
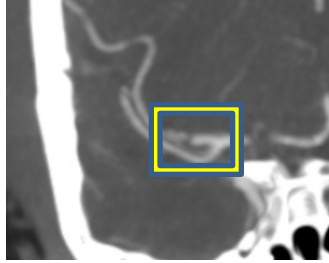
Case 36 y male

- NIHSS 1
- Slight pronation left hand
- Distal M1 occlusion



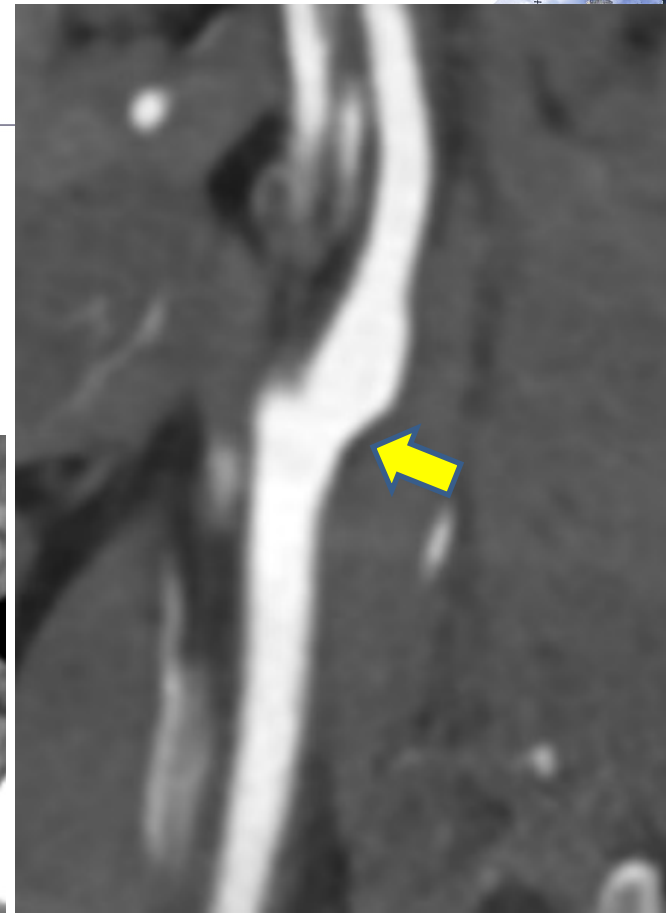
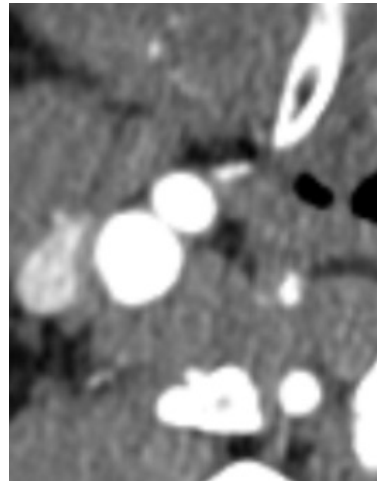
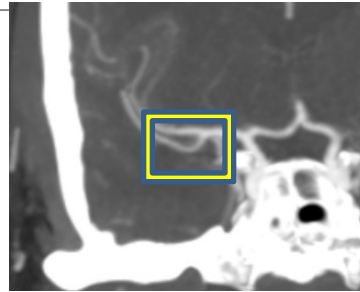
2 Days Later

- Distal M1 occlusion
- Floating thrombus



After 12 Days

- M1 occlusion gone
- Floating thrombus gone
- Carotid web not present anymore





Prevalence and Epidemiology

- Non selected consecutive patients:
 - 7/576 (1,2%) prevalence
- Acute Ischemic Stroke due to LVO
 - Symptomatic side: 2.5% carotid webs
 - Asymptomatic: 0.5% carotid webs.
- Pathology confirmed cases:
 - Young age (40.5 y; [IQR] 34-55)
- Female predominance

Kim et al. JAMA Neurology 2019

Table 1

Demographics and Clinical Characteristics

Parameter	Patients without Carotid Web at Symptomatic Side (n = 432)	Patients with Carotid Web at Symptomatic Side (n = 11)	P Value
Median age (y)*	66 (56–76)	59 (46–67)	.08
Sex (male)	260 (60.2)	1 (9.1)	<.001
History of ischemic stroke	45 (10.4)	1 (9.1)	>.99
Smoking	124 (28.7)	0	.04
Diabetes	56 (13)	0	.37
Atrial fibrillation	115 (26.6)	2 (18.2)	.73
Myocardial infarction	64 (14.8)	0	.38
Median systolic blood pressure (mmHg)*	143 (130–160)	143 (116–154)	.50
Location of intracranial occlusion			
Internal carotid artery (with possible involvement of M1)	118 (27.3)	4 (36.4)	.50
M1, M2, A1, A2	314 (72.7)	7 (63.6)	
Allocated treatment (intra-arterial treatment)	199 (46.1)	8 (72.3)	.12

Note.—Unless otherwise indicated, data are absolute values with percentages in parentheses.

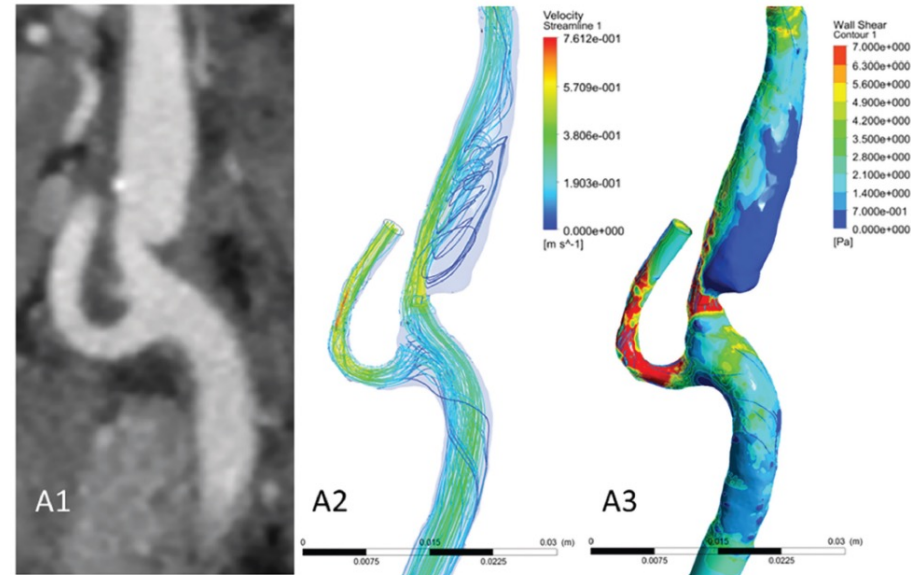
* Data in parentheses are interquartile ranges.

Compagne et al. Radiology 2018



Pathophysiology: Computational Fluid Dynamics

- 7 patients with CaW on CTA
- CFD analysis
- Carotid web associated with
 - considerable recirculation zones
 - regional increased wall shear stress.
- This suggests
 - thrombus formation
 - increased risk of acute ischemic stroke



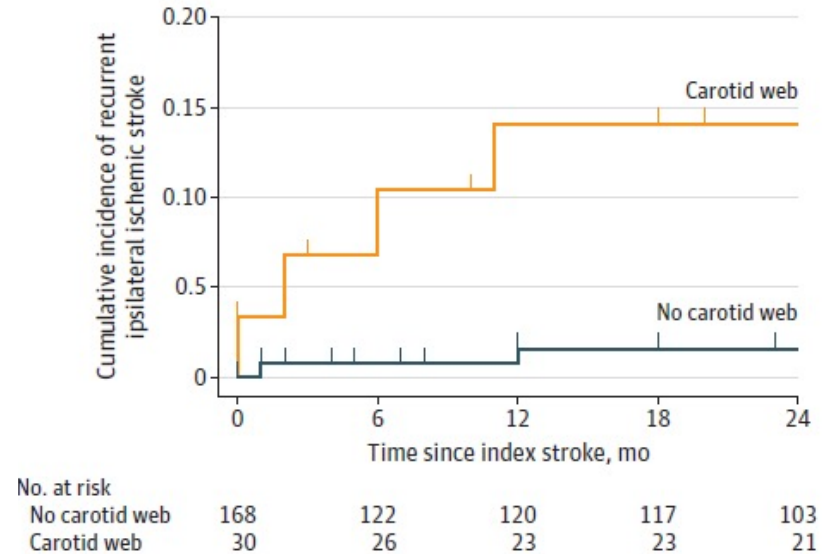
Compagne et al. AJNR Apr 2019



Carotid Web: Recurrent Stroke Risk

- Recurrent ipsilateral stroke within 24 Months:
 - Carotid Web:
 - 13% (4/30)
 - No Carotid Web:
 - 1% (2/168)
- Hazard Ratio: 9.9 (95% CI 1.8-54.2)
 - Adjusted: 8.1 (95% CI 1.4- 46.8)

B Recurrent ipsilateral ischemic stroke





Carotid Web: Treatment Options

Treatment	Patients With Symptomatic Carotid Web, n (%)	Recurrent Stroke, n (%)	Months to Recurrent Stroke (Median, Range)	Months Stroke Free If No Stroke Recurrence (Median, Range)
Medical management*	47/97 (53)	25/45 (56)	12 (0–97)	24 (14–100)
Antiplatelet	43/47 (91)	22/41 (54)	12 (0–97)	22.5 (14–100)
Anticoagulation	4/47 (9)	3/4 (75)	0.2 (0.2–6)	48 (48–48)
Carotid revascularization (all)†	70/97 (72)	0/42 (0)	‡	14 (3–144)
Carotid artery stent	35/70 (50)	0/25 (0)	‡	10.7 (3–144)
Carotid endarterectomy	35/70 (50)	0/17 (0)	‡	14 (6–120)

*Medical management alone without carotid revascularization.

†Fifty patients underwent carotid revascularization after their initial stroke; an additional 20 patients who were managed medically underwent carotid revascularization after recurrent stroke.

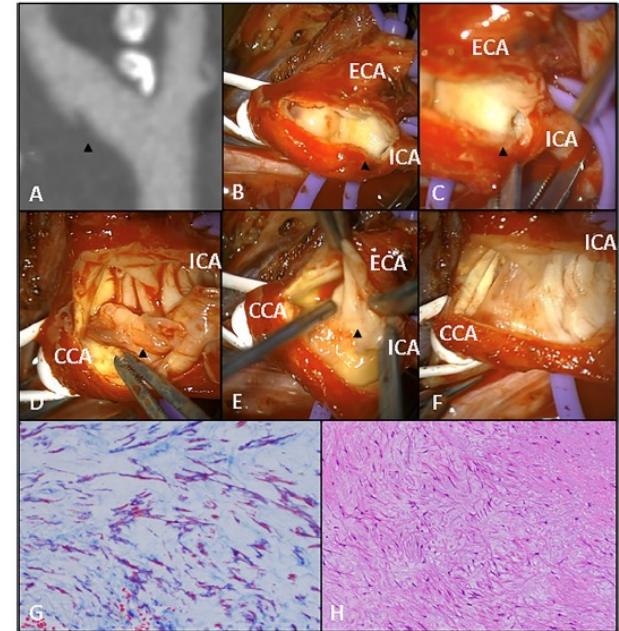
‡No recurrent stroke.



Surgery: Carotid Web

- CEA well established
- Pathological confirmation
- No long term medication
- Elongation not a problem

Mac Grory, et al. J Neurol Neurosurg Psychiatry 2020





Stenting Carotid Web

- Less complex compared to atherosclerotic stenosis
- No pre- and post-stent angioplasty
- High Bifurcation
- Combined with EVT

Haussen et al. Stroke 2017



Mac Grory, et al. J Neurol Neurosurg Psychiatry 2020



Future Directions

- Mechanisms of association with stroke
- Identification/misclassification?
 - Likelihood
 - Follow-Up imaging
- Optimal treatment

Mac Grory, et al. J Neurol Neurosurg Psychiatry 2020



Carotid Web: Summary

- Increased prevalence in stroke patients < 60 years
- Possible cause for cerebral thrombo-embolism
- Consider in anterior circulation strokes of undetermined cause
- Higher risk of recurrent stroke
- Optimal treatment yet to be determined
 - Multi-center observational studies warranted



CAROWEB

- French registry (n=202)
 - All ethnicities
 - Secondary prevention heterogeneous

Patient characteristics	Value
Age at first-ever IS/TIA (years)	49.9 ± 12.3 (22–89)
Age at index IS/TIA (years)	50.8 ± 12.2 (22–89)
Female	127 (62.9%)
Ethnic group	
Sub-Saharan African	25 (12.4)
North African	12 (5.9)
Afro-Caribbean	41 (20.3)
Asian	1 (0.5)
Caucasian	96 (47.5)
Other	6 (3)
Not determined	21 (10.4)
History of IS/TIA	38 (18.8)
Number of previous IS/TIA: 1/2/3	31 (15.3)/4 (2)/3 (1.5)
Ipsilateral to the index IS/TIA	36 (17.8)
Contralateral to the index IS/TIA	2 (1)
Vascular risk factors	125 (61.9)
Hypertension	38 (18.8)
Diabetes	12 (5.9)
Dyslipidemia	36 (17.8)
Smoking	63 (31.2)
Antithrombotic treatment at admission	36 (17.8)
Antiplatelet	29 (aspirin, 23 and clopidogrel, 9)
Oral anticoagulant	7 (DOA, 5 and VKA, 2)
Admission mRS score, 0–2	199 (98.5)

Olindo, et al. International Journal of Stroke 2023



Spain

RECRUITING ⓘ

Carotid Web and Stroke Registry.

ClinicalTrials.gov ID ⓘ NCT05475080

Sponsor ⓘ Fundació Institut de Recerca de l'Hospital de la Santa Creu i Sant Pau

Information provided by ⓘ Fundació Institut de Recerca de l'Hospital de la Santa Creu i Sant Pau (Responsible Party)

Last Update Posted ⓘ 2022-08-01



+ Expand all content

- Collapse all content

Study Details

Researcher View

No Results Posted

Record History

On this page

Study Overview

Contacts and Locations

Participation Criteria

Study Plan

Collaborators and Investigators

Study Overview

Brief Summary

Introduction:

Carotid Web (CW) is a common cause of stroke in young patients with a high recurrence rate. The factors associated with recurrences and the appropriate treatment to prevent them are currently unknown.

Study Start (Actual) ⓘ

2022-07-15

Primary Completion (Estimated) ⓘ

2024-07-15



References

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