

## IMAGEM EM NEUROLOGIA/IMAGE IN NEUROLOGY

## An unrecognized cause of recurrent ischemic stroke

## Uma causa pouco conhecida de AVC isquémico recorrente

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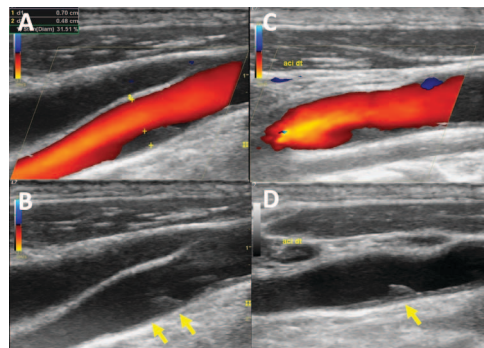
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A 57-year-old man, smoker, with history of hypertension, was admitted to the emergency room one hour after acute-onset left hemiparesis, left homonymous hemianopia and sensory neglect (NIHSS 16). Head computed tomography (CT) scan was unremarkable (ASPECTS 10) and CT angiogram (CTA) showed occlusion of the M1 segment of the right middle cerebral artery (MCA). The patient underwent a combined reperfusion therapy with intravenous recombinant tissue plasminogen activator plus mechanical thrombectomy (final TIC1 score 2b). A small right striatal infarction was observed in control CT scan. Carotid and vertebral Doppler ultrasound (US) and cervical CTA disclosed a heterogenous, regular, substantial echolucent lesion in the origin of the right internal carotid artery (ICA), suggestive of an ulcerated atherosclerotic plaque with distal adherent



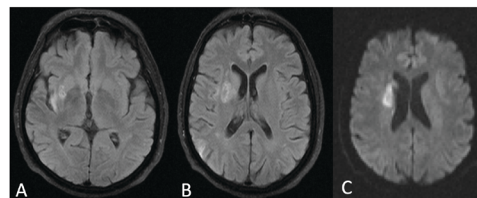
**Figure 1.** Carotid web of right ICA; A, B – Carotid Doppler ultrasound of right ICA, revealing a heterogenous, regular, substantial echolucent lesion in the origin of right ICA, interpreted as an ulcerated atherosclerotic plaque causing a 30% stenosis. C, D – Carotid Doppler ultrasound performed 2 months later, showing the persistence of the endoluminal protrusion in right ICA bulb, but now without adherent thrombus (arrows).



**Figure 2.** CT angiography (A – sagittal MIP reconstruction; B – 3D-VR reconstruction) and digital subtraction angiography (C – lateral projection, injection in the right common carotid artery) show the typical shelf-like luminal defect protruding from the posterior wall of the right carotid bulb, characteristic of carotid web. Note how the defect is pointing up, unlike the double lumen sign of arterial dissection.

thrombus causing a 30% stenosis. Transcranial Doppler evaluation was unremarkable. Other causes of stroke were excluded, namely cardioembolism and hypercoagulability factors. The patient started dual antiplatelet therapy and high-dose statin and was discharged home with left hemiparesis grade 4 (NIHSS 3).

He was readmitted 2-months later due to one-week history of spatial disorientation, short-term memory deficit and left hemiparesis exacerbation. Brain magnetic resonance imaging (MRI) showed new ischemic vascular



**Figure 3.** Brain MRI (A and B – FLAIR; C – DWI) showed ischemic lesions spread throughout the right MCA territory, namely in the right lentiform nucleus (with restricted diffusion, as seen in C), posterior insular cortex and parietal cortex (consistent with distal emboli).

lesions within the right ICA territory (insula and parietal lobe). The repetition of US revealed the persistence of the isoechoic endoluminal protrusion in the right ICA bulb but without the distal echolucent material previously identified (adherent thrombus) and led to the diagnosis of a “carotid web”. This finding was also observed in MRI angiogram. The patient underwent elective carotid stenting, and no recurrent strokes were observed.

Carotid web is recognized as an atypical form of fibromuscular dysplasia. It is an intimal-predominant projectile shelf-like structure on the lateral posterior aspect of the carotid bulb.<sup>1-3</sup> The exact prevalence is unknown, and this entity is probably underdiagnosed. Carotid web is now recognized as a cause of recurrent anterior circulation stroke/transient ischemic attack (TIA). It should be considered in cryptogenic stroke, particularly in younger patients without vascular risk factors.<sup>2,4</sup> The proposed pathophysiological mechanism is altered hemodynamics distal to the web, leading to flow stagnation and remote embolization of fibrin-based clots.<sup>1,4</sup>

Carotid webs may be misinterpreted as non-calcified atherosclerotic plaque and arterial dissection. However, dissections typically affect the middle and distal ICA and may be associated with a history of trauma and pain complaints. Although no randomized therapeutic studies are available, management options include antiplatelet therapy, anticoagulation or revascularization (carotid endarterectomy or stenting).<sup>1,5</sup>

Carotid webs should be suspected in young patients presenting with recurrent ipsilateral strokes/TIA. Stroke physicians should be aware of this entity since its early identification and appropriate management can reduce the risk of recurrent vascular events. Given its rarity, this entity remains a diagnostic and therapeutic challenge, leading to divergent diagnostic labels in the absence of a high index of suspicion. ■

#### Contributorship Statement / Declaração de Contribuição

IG: Conception, writing and final approval.

RV: Conception, critical review and final approval.

OG: Images preparation, critical review and final approval.

FS: Conception, critical review and final approval.

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#### References / Referências

1. Kim SJ, Nogueira RG, Haussen DC. Current Understanding and Gaps in Research of Carotid Webs in Ischemic Strokes: A Review. *JAMA Neurol.* 2019;76:355-61. doi: 10.1001/jama-neurol.2018.3366.
2. Kim SJ, Allen JW, Bouslama M, Nahab F, Frankel MR, Nogueira RG, Haussen DC. Carotid Webs in Cryptogenic Ischemic Strokes: A Matched Case-Control Study. *J Stroke Cerebrovasc Dis.* 2019;28:104402. doi: 10.1016/j.jstroke-cerebrovasdis.2019.104402.
3. Olindo S. Stroke Recurrence in First-Ever Symptomatic Carotid Web: A Cohort Study. *J Stroke.* 2021;23:253-62.
4. Guglielmi V. Assessment of Recurrent Stroke Risk in Patients With a Carotid Web. *JAMA Neurol.* 2021;78:826-33.
5. Haussen DC, Grossberg JA, Bouslama M, Pradilla G, Belagaje S, Bianchi N, et al. Carotid Web (Intimal Fibromuscular Dysplasia) Has High Stroke Recurrence Risk and Is Amenable to Stenting. *Stroke.* 2017;48:3134-7. doi: 10.1161/STROKEAHA.117.019020.