

Hypoplasia of the internal carotid artery

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Section: Neuroradiology

Area of Interest: CNS Head and neck

Imaging Technique: CT

Imaging Technique: CT-Angiography

Imaging Technique: MR

Special Focus: Arteriovenous malformations Case Type:

Clinical Cases

Authors: Francken K1, Eyselbergs M2, Vanhoenacker

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Patient: 50 years, female

Clinical History:

A 50-year-old woman consulted the neurologist for sudden right-sided visual loss. Symptoms only lasted for several minutes. The patient was free of symptoms at the time of consultation. Further physical and neurological examinations were normal. Past medical history included breast carcinoma.

Imaging Findings:

Axial T2-WI of the brain shows an absent flow void in the right internal carotid artery at intracranial level (Fig. 1). Subsequent CT angiography reveals a hypoplastic carotid artery on the right side with reduced flow in accordance with the MRI findings (Fig. 2).

Discussion:

Structural anomalies of the internal carotid artery (ICA) related to developmental defects are very rare and can be categorised as follows: [1]

- Agenesis (absence of both ICA and bony carotid canal)
- Aplasia (extremely small diameter of the ICA and persistent bony carotid canal)
- Hypoplasia (the ICA is small but continuous, as well as the carotid canal)

These anomalies can be either unilateral or bilateral, although the unilateral variant is more common [2]. There is predilection for the left side with a reported ratio of cases of 3:1 [3,4]. Our case consists of hypoplasia of the right internal carotid artery.

Unilateral involvement is thought to result from a mechanical constriction of amniotic bands or a haemodynamic vascular insult during embryogenesis. No explanation for bilateral absence has been proposed thus far [2].

Most cases are clinically silent, due to well-developed collateral circulation [2]. Symptoms may arise later in life, particularly with progression of associated atherosclerotic disease [5]. Developmental anomalies of the ICA have also been associated with an increased incidence of cerebral aneurysms, which is reported to be 24-34%, compared to 2-4% in the general population [6]. Increased flow through collateral vessels and altered flow dynamics are cited

as plausible explanations. Therefore, screening of cerebral aneurysms in patients with known carotid agenesis is useful.

Other clinical symptoms include pulsatile tinnitus, recurrent headaches, blurred vision, hearing loss, ischaemic stroke/transient ischaemic attack (TIA) symptoms, migraine and Horner's syndrome [7,8].

The diagnosis of ICA hypoplasia is mainly based on imaging, such as magnetic resonance angiography (MRA), digital subtraction angiography (DSA), CT angiography (CTA) and CT of the skull base. Agenesis can be differentiated from hypoplasia by showing complete absence of the carotid canal. CT of the skull base is a useful tool for making this differential diagnosis. In case of hypoplasia, a small osseous carotid canal can still be seen on thin CT slices [9].

Early recognition of developmental abnormalities of the carotid circulation may have important implications, particularly in the setting of thromboembolic disease, cerebral aneurysms, and risk stratification during carotid endarterectomy or transsphenoidal hypophyseal surgery [2,7]. There may be a transsellar intercavernous anastomosis, which can cause devastating complications during transsphenoidal pituitary surgery [10].

Currently, there are no guidelines for management of hypoplasia of the internal carotid artery.

Regular follow-up by non-invasive imaging is recommended to identify potential aneurysms.

Written informed patient consent for publication has been obtained.

Differential Diagnosis List: Congenital hypoplasia of the internal carotid artery , Stroke, Migraine, CADASIL

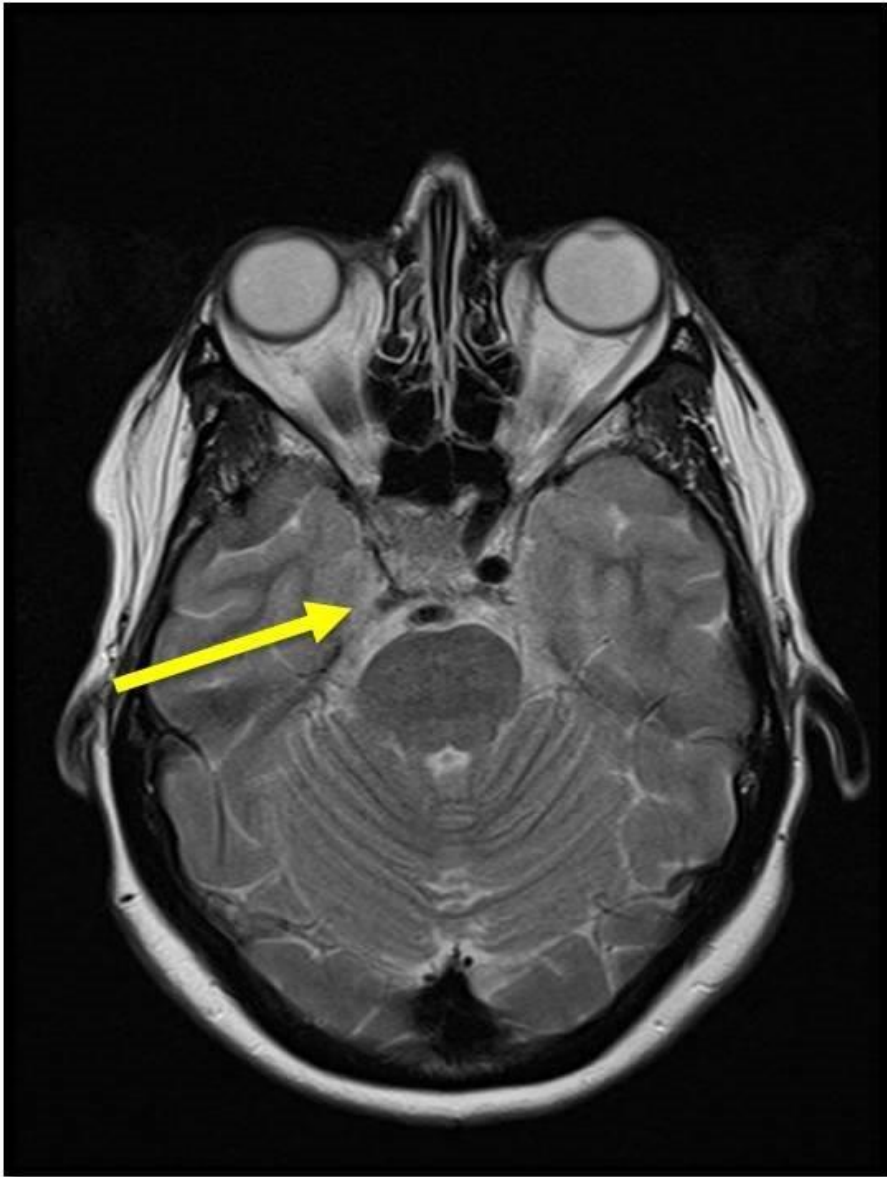
Final Diagnosis: Congenital hypoplasia of the internal carotid artery

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Figure 1

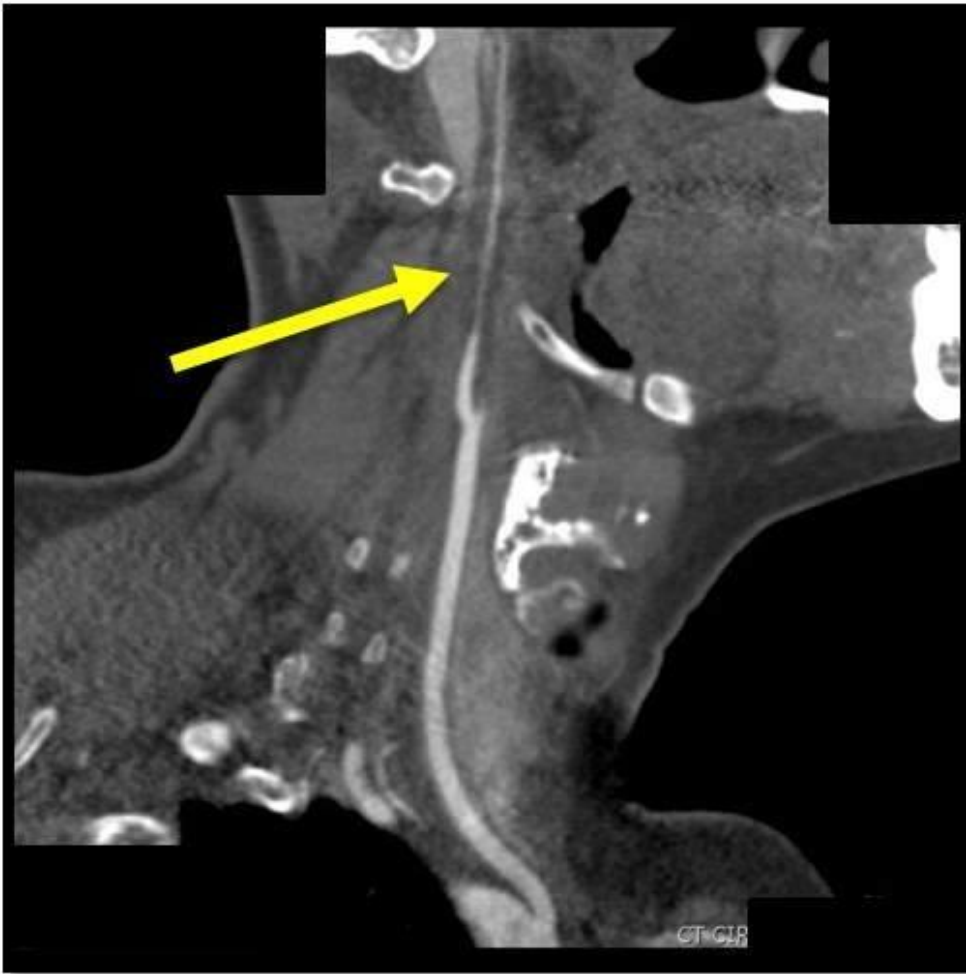
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Description: Axial T2-WI shows absent flow void at the right ICA **Origin:** © Department of Radiology, General Hospital St. Joseph, Malle, Belgium 2018

Figure 2

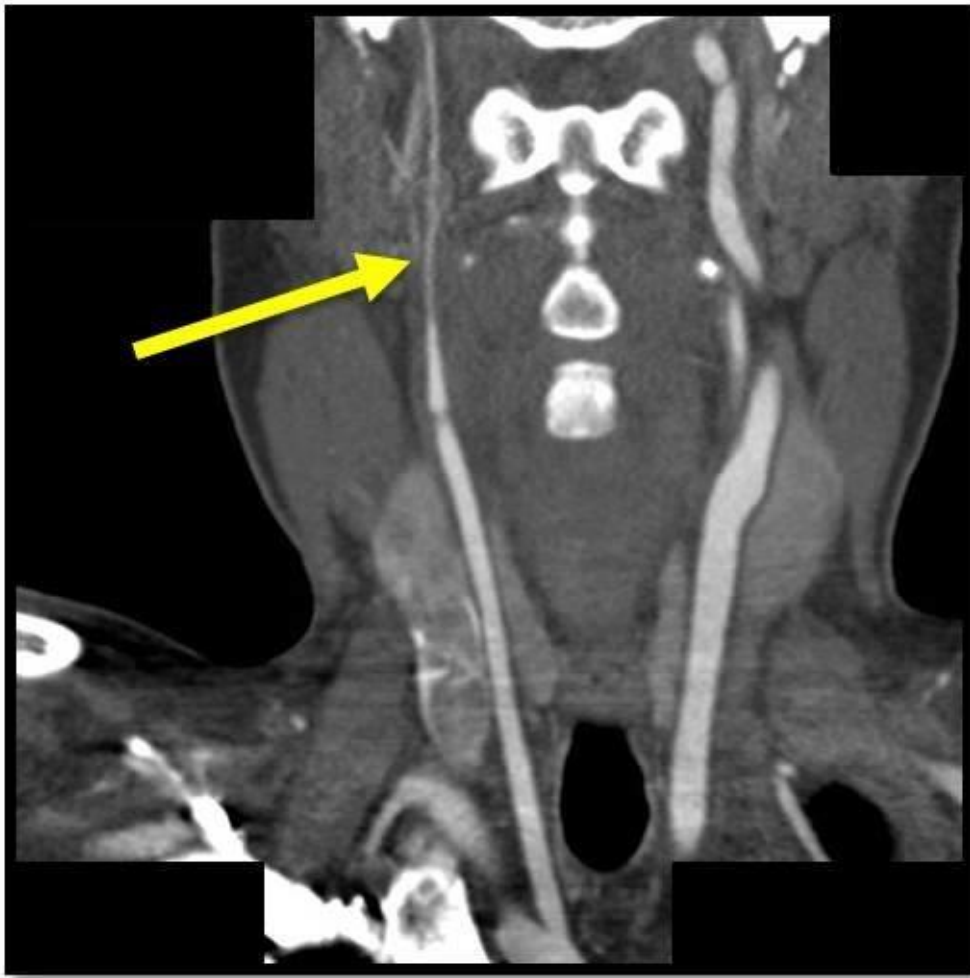
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Description: CT angiography (curved reformatted images) shows a small right internal carotid artery

Origin: © Department of Radiology, General Hospital St. Joseph, Malle, Belgium 2018

b



Description: CT angiography (curved reformatted images) shows a small diameter of the right internal carotid artery compared to the left carotid artery **Origin:** © Department of Radiology, General Hospital St. Joseph, Malle, Belgium 2018