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Case Report

Absent right internal carotid associated with posterior cerebral artery aneurysm: A case report

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ABSTRACT

Introduction: and importance: An uncommon condition is congenital unilateral agenesis of the internal carotid artery (ICA). Most instances are asymptomatic due to adequate collateral circulation via the circle of Willis, but individuals might potentially manifest (or show) ischemic or aneurysmal dilatation hemorrhagic cerebrovascular lesions. The bony carotid canal must be absent from distinguishing this abnormality from chronic ICA blockage. Neuroradiologists must be aware of this condition since these patients have a higher risk of developing numerous intracranial diseases.

Case presentation: This report focuses on the case of 39 years male with an absent right internal carotid artery with posterior cerebral artery aneurism whose main symptoms were on and off headaches. In a discussion that includes demographic characteristics, clinical manifestations, radiologic findings, and an assessment of the risks associated with ICA agenesis.

Conclusion: Congenital agencies absence of carotid artery is rare variant anatomy although most of the time they are asymptomatic, it is known to increase the risk of aneurism and therefore, they need screening and close follow up.

1. Introduction

The absence of the internal carotid artery (ICA) at birth is uncommon. The carotid canal, which is found in the temporal bone, is a vital anatomical feature at the base of the skull. The ICA, the sympathetic nerve plexus, and the internal carotid venous plexus, a venous network encircling the ICA that connects to the cavernous sinus, are all carried through the carotid canal [1]. Congenital absence of the ICA is often associated with carotid canal atresia and ICA-related structural abnormalities, such as variations in the origin of the ophthalmic artery, pituitary hypoplasia, sympathetic nerve dysplasia, and the abnormal development of collateral circulation pathways is the result of the close relationship between the carotid canal and the ICA during embryonic development. Asymptotictate, transient ischemic attack (TIA), subarachnoid hemorrhage (SAH), hypopituitarism, and developmental abnormalities in numerous organs are all clinical indications of this condition [2]. There is no comprehensive data on the correlations between embryonic development, radiologic findings, and clinical presentation in patients with ICA agenesis [3]. The current study reports the case of ICA agenesis, analyzes the demographic characteristics, clinical manifestations, and radiologic findings of this case, and assesses the risks associated with ICA agenesis.

2. Case report

The subject of this case study is a 39 years old male medically and surgically free who has been having on and off headaches for a long time. In the last year, he was exposed to COVID-19 and developed a severe headache that woke him from sleep with no neurological symptoms.

The initial CT brain scan not shown in this report was negative. CTA (Figs. 1–4) followed by cerebral angiogram (Figs. 5 and 6) showed an

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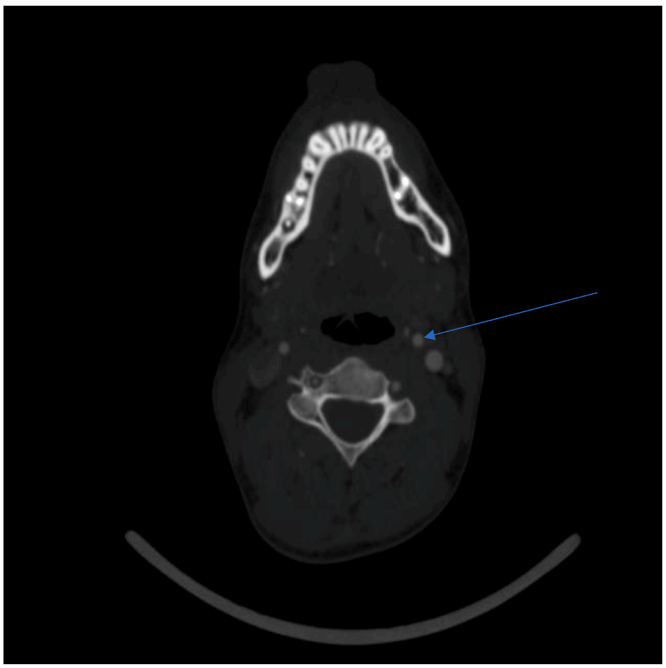

Fig. 1. Axial CT brain angiogram shows the absence of the right internal carotid artery while the left internal carotid is illustrated by an arrow.

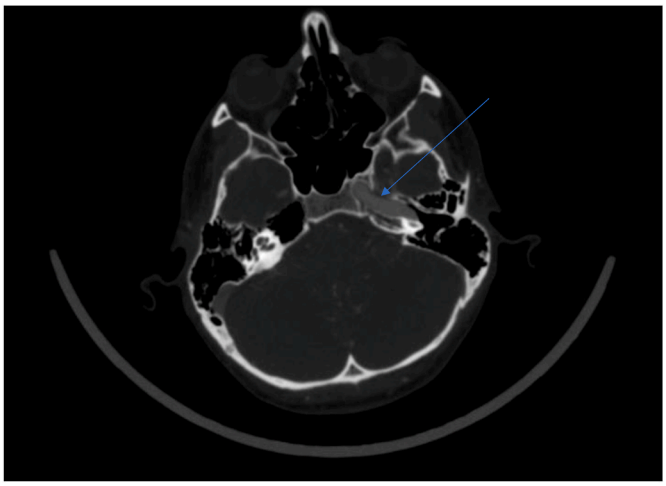

Fig. 2. Axial CT brain angiogram shows the absence of the right internal carotid artery while the left internal carotid is the subject of this visualization.

absent right internal carotid artery and aneurismal dilatation of the posterior communicating artery. The neuroradiologist told the patient that treatment of posterior communicating artery aneurism might be difficult and his variant anatomy might cause his death. The patient decided not to do the procedure and the neurology team offered for him to follow up for his aneurysm and he agreed to that.

3. Discussion

The ICA is seldom abnormally developed, and it was reported that the first incidence of ICA agenesis in 1787 was discovered by chance during a postmortem investigation [4]. Another study identified ICA agenesis as the ICA's total inability to develop and ICA hypoplasia as the ICA's partial development in 1968 [5]. The prevalence of ICA agenesis is expected to be less than 0.01%, and bilateral ICA agenesis as being more uncommon [6].

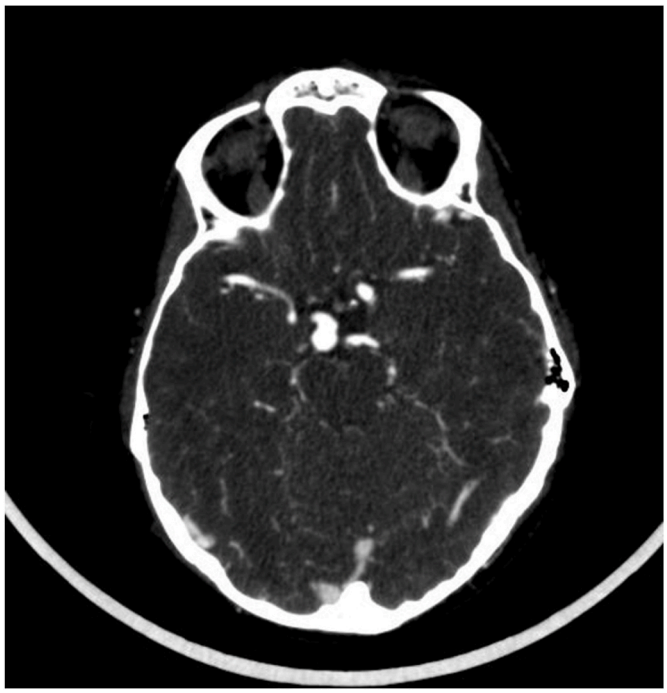

Fig. 3. Axial CT brain angiogram shows the posterior cerebral artery dilation.

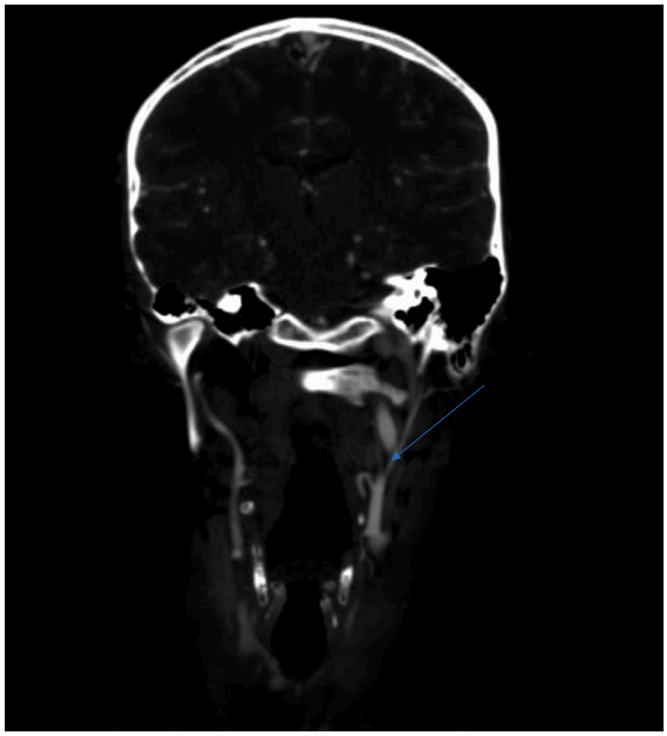

Fig. 4. A coronal CT brain angiogram shows the absence of the right internal carotid artery while the left internal carotid is illustrated by an arrow.

Agenesis of ICA is uncommon, and its connection with third nerve palsy is much more uncommon. Most patients with ICA agenesis are asymptomatic because of collateral circulation from the contralateral ICA and vertebrobasilar system, but some may have headaches, subarachnoid hemorrhage, and transient ischemic episodes. It has been suggested that the causal mechanism for ICA agenesis is mechanical or creates hemodynamic shocks to the developing embryo [7]. On the 24th

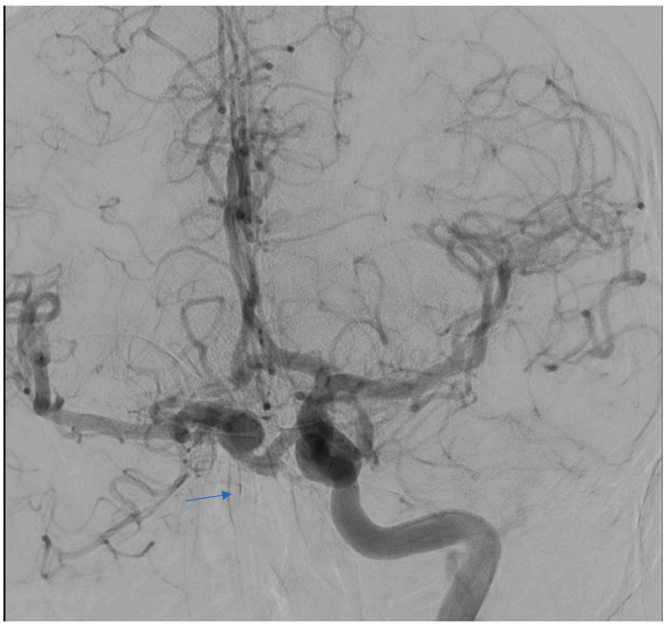

Fig. 5. The digital subtraction image shows the absence of the right internal carotid artery arrow.

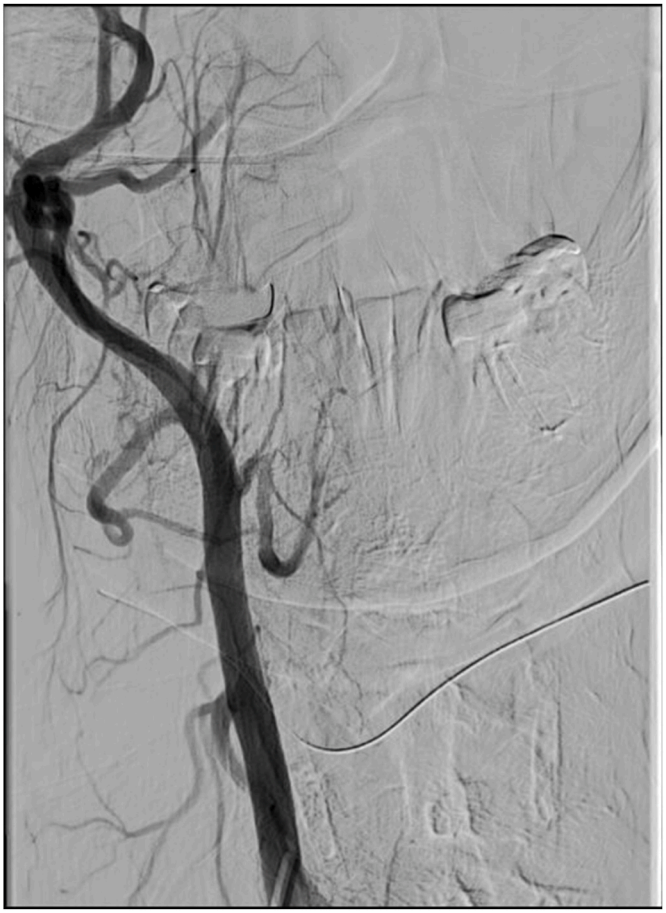

Fig. 6. Digital subtraction images at the right common carotid artery show that only the external carotid artery is illustrated with the absence of the internal carotid artery.

day of embryonic development, the ICA originates from the dorsal aorta and the third aortic arch (4–5 mm embryonic stage) and is completed by the 6th week. The carotid artery (ECA) and its branches are created by the carotid artery (ECA). During the 40th day (16–18 mm stage) the creation of the carotid canal happens at the same time and is dependent on the development of the ICA, which shows that the lack of the ICA is congenital [8].

The following are the several types of ICA development anomalies: (a) agenesis (complete failure of arterial development – both the ICA and the carotid canal are absent); (b) aplasia (lack of development – traces present non-patent vessels, as well as the carotid canal) and (c) hypoplasia (incomplete artery development – one of the ICA with a narrowed but still functional vascular lumen accompanied by a carotid artery that is smaller yet well-structured) [9].

Mechanical (pressure effects), excessive bending of the cephalic end of the embryo to one side or the other, or constrictions by amniotic bands could cause ICA agenesis/aplasia [10].

Imaging investigations like CT, MRI, carotid Doppler ultrasonography, or conventional as well as CT/MR angiography can be used to identify and detect the absence of the ICA [11].

Intracranial aneurysms, transsphenoidal encephaloceles, and a large rete mirabilis (vascular network breaking the continuity of an artery or vein in the tissue) are linked at the cranial base to ICA agenesis [12]. Associated vascular insufficiency and/or cerebral ischemia owing to alterations in collateral flow might cause the manifestations of clinical symptoms. Recurrent headaches, blurred vision, loss of hearing, and hemiparesis with or without cranial nerve palsy are all possible symptoms [13]. As a result of a related aneurysm, patients may have a subarachnoid hemorrhage. Approximately 25% of individuals with symptomatic ICA agenesis present with all intracranial hemorrhage symptoms have intracranial aneurysms [14].

In our case study, axial, coronal CT brain angiogram and digital subtraction images show the absence of the right internal carotid artery while the left internal carotid is visualized and posterior cerebral artery dilatation. Three cases (0.16%) of unilateral agenesis of ICA, bilateral agenesis of ICA, and bilateral hypoplasia of ICA were documented in a study by Akdemir et al. The circle of Willis connecting arteries, intercavernous anastomosis, and communicating arteries from the external carotid artery provide collateral cerebral circulation. The majority of patients with persisting embryologic arteries to the carotid artery region, are asymptomatic [15].

Three types of collateral pathways have been identified in individuals with unilateral or bilateral ICA agenesis. The fetal type of these collateral circulations is the most common. The standard contralateral ICA supplies the ipsilateral anterior cerebral artery and the ipsilateral medial cerebral artery via the anterior communicating artery and the basilar artery via an ipsilateral dominant posterior communicating artery. In the second variety, known as the adult form, the contralateral anterior cerebral artery supplies the ipsilateral anterior cerebral and middle cerebral arteries of the afflicted side through the anterior communicating artery. In the rarest and third type, transcranial anastomosis is formed by the external carotid system, the contralateral ICA, or certain primitive vessels such as persistent hypoglossal arteries, persistent tympanic or stapedial arteries, and trigeminal arteries maintain arterial blood flow [16]. This case report has been reported in line with the SCARE 2020 criteria [17].

4. Conclusion

39 years old male who was found to have a rare variant anatomy agenesis of right ICA with posterior communicating artery aneurism the patient preferred not to intervene with his aneurysm and continue close follow up. Although Congenital agencies absence of carotid artery is rare variant anatomy most of the time, they are asymptomatic, it is known to increase the risk of aneurism and therefore, screening for associated aneurisms and close follow up is recommended.

Ethical approval

Yes ethical approval was done at Research & Innovation Centre. King Saud Medical City, Riyadh, KSA.

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None.

Author contributions

Abdullah Ali AlQarni: manuscript writing and diagnosis.
Ali Mohammed AlQarni: manuscript writing and conceptualization.
Mohammed Fatani: diagnosis of the case.
Ali Mekbel Aldahmashi: diagnosis of the case and manuscript writing.
Jaber A. Alfaifi: manuscript writing.

Registration of research studies

1. Name of the registry:
   Dr Riaz Agha.
2. Unique identifying number or registration ID: researchregistry8114
3. Hyperlink to your specific registration (must be publicly accessible and will be checked):https://www.researchregistry.com/browse-the-registry#home/

Guarantor

Abdullah AlQarni.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Provenance and peer review

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Declaration of competing interest

No conflict of interest.

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