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Case Report

Incidental finding of left vertebral artery agenesis: Case report ☆,☆☆

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ABSTRACT

Vertebral artery agenesis is a rare congenital malformation, with few reported cases in the literature and no epidemiological data in the world at this point in time. The importance of diagnosis lies in identifying a potential risk factor for future ischemic events of the posterior circulation, in particular in the young population. It is also important to determine the etiology of chronic headache of unexplained cause that could be attributed to this entity. The present case describes this finding in a 27-year-old female patient with no pathological history, with multiple stab wounds was brought to the emergency room of our hospital .During the study of whether the wounds caused had been penetrating to the neck, a CT angiography was performed. The CT documented an incidental finding of absent left transverse foramen of the cervical vertebrae, absence of the left vertebral artery from its origin in the ipsilateral subclavian artery and a single dolichoectatic right vertebral artery crossing the midline at the entrance to the foramen magnum.

Introduction

Little known in the literature, vertebral artery (VA) agenesis is defined as the complete congenital absence of the vertebral artery at organogenesis from germ cells during embryonic life.

Case description

A 27-year-old female patient with no pathological history, referred to the emergency services from a level I hospital due to multiple stab wounds to the face and the cervical, occipital and abdominal regions. CT angiography of the neck, using

Abbreviations: VA, vertebral artery; MRA, magnetic resonance angiography.

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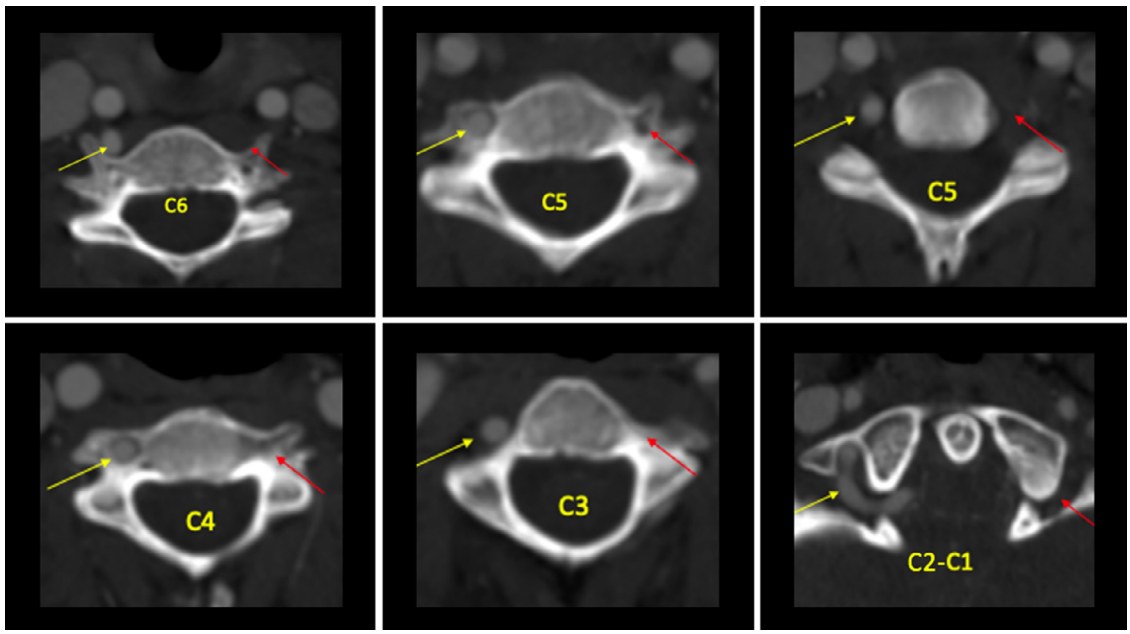

Fig. 1 – Caudocephalic axial sequences of a neck CT angiography from the C6 to C1 vertebrae. The yellow arrow represents the course of the right vertebral artery until it reaches the base of the skull. The red arrow represents the absence of the left vertebral artery and the agenesis of the transverse foramen throughout its course.

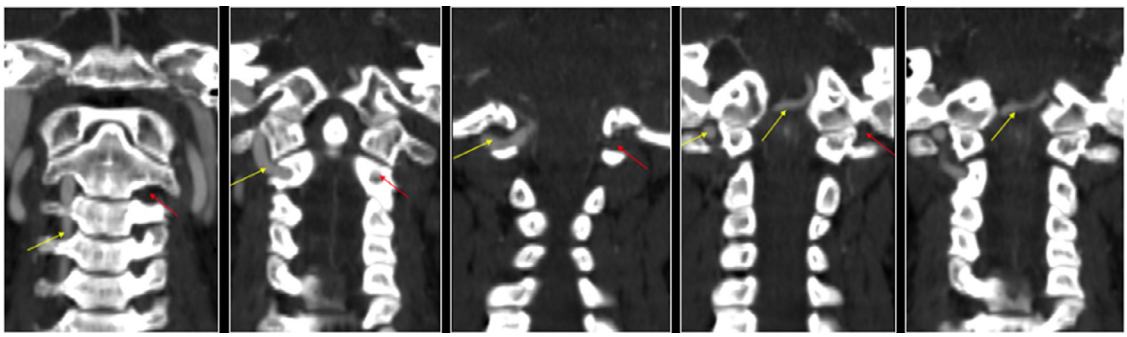

Fig. 2 – Coronal sequences from anterior to posterior of a neck CT angiography: The yellow arrows indicate the course of the right vertebral artery until it enters the base of the skull as a single artery to form the basilar artery. Red arrow indicates the absence of the left vertebral artery.

a 64-channel scanner, was required as part to the workup in order to assess the extent of the compromise. No vascular injuries of traumatic origin were found but the absence of the left vertebral artery throughout its entire trajectory was documented as an incidental finding, starting from the V1 segment where its origin from the left subclavian artery was not evident, later in the V2 or foraminal segment this vessel was not found as well to the agenesis of the ipsilateral transverse foramen in its entirety from the C6 to C1 vertebrae. The V3 and V4 segments were not formed either. On the contralateral side, a dominant dolichoectatic right vertebral artery was evident, adequately opacified throughout its course, with high entry from V1 to through the foramen of the C5 vertebrae. The artery arrived as a single vessel, entering through the foramen magnum forming the V4 or intracranial portion and traversing along the midline to form the basilar artery (Figs. 1 and 2).

During the review by systems on admission the patient reported intermittent headache from a very young age that usually resolved with conventional analgesia. She did not report additional symptoms such as vertigo, dizziness or loss of consciousness. Her neurological examination was normal and he did not present any deficit. She was previously unaware of this anatomical variant found with the tomography and had no history of malformations, ischemic events or neurological deficits in her family.

Discussion

The term agenesis refers to the complete absence of an organ and its corresponding primordium. Causes of these con-

genital malformation are secondary to genetic factors such as the presence of chromosomal alterations or single gene mutations in Mendelian inheritance, including epigenetic factors [1]. Exposure of both the fetus and the mother to environmental factors during gestation may give rise to devastating consequences of delays in pre- and postnatal development. Viral infections (rubella), the use of drugs or chemical products (warfarin, alcohol, thalidomide, anticonvulsants), and diabetic embryopathy have been shown to be associated with cardiac malformations, neural tube defects and other central nervous system alterations [1].

Two important points in time for the development of teratogenic congenital malformations have been identified depending on the stage of intrauterine development: first, the early embryonic period from fertilization to the third week of gestation, where a harmful agent may cause apoptosis, inducing miscarriage and demise. Weeks 4 and 5 being the organogenesis stage during which the risk of teratogenic damage is highest, they are the time period during which agenesis of any organ may occur. The second point in time is the fetal period following organ generation when organ growth and maturation begins, with higher susceptibility to growth delays of organs that have already formed [1].

The vertebral artery is the first branch of the subclavian artery. It has a posterosuperior trajectory until it reaches the ventral aspect of the costotransverse process of the seventh vertebra between the long neck and ventral scalenus muscles (V1 or extraosseous segment) to immediately enter through the transverse foramen of the sixth cervical vertebra. Since then, it ascends through each foramen to the C1 vertebra (V2 or foraminal segment). Upon reaching the lateral masses of the atlas, it surrounds them backwards and inwards to traverse the posterior occipito-atloid membrane and become intradural (V3 or extraspinal segment). Already in the prebulbar cistern, it will join with the contralateral vertebral artery (V4 or intradural segment) to form the intracranial basilar artery [2].

There are few cases reported in the literature regarding this entity, the main descriptions referring to hypoplastic vertebral arteries. Chuang et al. found a prevalence of 2.1% in one thousand asymptomatic patients using ultrasound and a VA diameter of less than 2.5 mm as a diagnostic criterion [3]. In 2008, Kohei Morimoto et al. published a study of VA aplasia using magnetic resonance angiography (MRA) in healthy patients and found an incidence of 4.6%. The authors compared their result with the accepted 0.2% incidence reported in a single previous study, and ratified the importance of correlating findings with MRA scans [4].

Although most on the data in the literature deal with VA hypoplasia and its correlation with diminished brain perfusion [5], there are reports of Doppler studies performed in infants citing a 1.4% of unilateral vertebral artery agenesis. These studies have found a relationship with the occurrence of the left primitive trigeminal artery and the so-called intermediate communicating artery in cases of left vertebral artery agenesis. Specific symptoms have been associated with this entity, including headache, vertigo and weakness [6]. Aristeidis H et al. in their review article explain that vertebral artery hypoplasia alone is not a risk factor for stroke; however, in the presence of risk factors, it is closely associated with posterior circulation stroke (Wallenberg syndrome) and atherosclerotic as well as prothrombotic processes [7]. Another study found one case in which the patient reported not being able to find a left carotid pulse following physical exertion, with a finding of agenesis of left internal carotid artery and of the ipsilateral vertebral artery [8]. The prevalence of carotid agenesis has been estimated at 0.01%, without epidemiologic data pertaining to arterial compromise [9].

Conclusion

Adequate study of the vertebrobasilar anatomy allows a diagnostic approach to embryonic as well as acquired pathologies, VA hypoplasia, agenesis and occlusion being the most frequent. Ensuring adequate follow-up of these patients becomes a goal in order to prevent posterior fossa strokes.

Patient consent

The patient has been informed and has given his consent to the publication of this case report.

Ethical approval

We have received informed consent from the patient for the publication of both his clinical history and the images presented. This report has also been approved by the ethics committee of the hospital where the case was diagnosed, the documents are available upon request.

Authors' contribution

JPC: Diagnosis, Data Collection. LCR: Project development, Data Collection, Manuscript writing. NB: Project development, Data Collection, Manuscript writing. MH: Project development.

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