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Case Report

Congenital Absence of Right Internal Carotid Artery: Demonstration of Collateral Circulation by Computed Tomography Angiography

Afak Durur-Karakaya[1], Irmak Durur-Subasi[2]* and Adem Karaman[2]

[1]*Regional Training and Research Hospital, Department of Radiology, Erzurum-Turkey*

[2]*Ataturk University, Faculty of Medicine, Department of Radiology, Erzurum-Turkey*

***Corresponding author:** Irmak Durur-Subasi, MD, Specialist of Radiology, Assistant Professor, Terminal m. Somunoglu c. Kardelensitesi B/1225240 Erzurum, Turkey, Tel: +905334603846; Fax: +904422361014; E-mail: irmakdurur@yahoo.com

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Abstract

In this paper we demonstrated a case with right internal carotid artery absence and collateral circulation via anterior communicating artery. A 58-year-old female with vertigo was referred to our department for computed tomography angiography. On arterial phase images, there was no internal carotid artery on the right. At the level of circle of Willis, right anterior and middle cerebral arteries were supplied by the contralateral internal carotid artery by means of anterior communicating artery. On bone window right carotid canal is also absent. Volume rendering technique revealed the absence of right internal carotid artery and collateral circulation via anterior communicating artery clearly. Absence of internal carotid artery is generally asymptomatic. Computed tomography angiography can visualize pathologies of carotid arteries and circle of Willis. It can also reveal the accompanying carotid canal agenesis which further helps to diagnosis. Volume rendering technique provides a global and clear inspection of collateral circulation.

Keywords: Absence; Internal carotid artery; Computed tomography angiography

Introduction

The internal carotid artery emerges from the common carotid artery at the level of the neck and supplies the anterior part of the brain, the eye and its appendages, nose, and anterior portion of head. In the absence of this artery these regions are supplied by the collateral circulation. The most important collateral circulation must be anterior and posterior communicating arteries for the brain. In this paper we demonstrated a case with right internal carotid artery absence and collateral circulation via anterior communicating artery.

Case Report

A 58-year-old female with vertigo had been evaluated by colour Doppler sonography and right internal carotid artery had not been visualized. She wasalso examined by computed tomography angiography. Computed tomography was performed by a 64-slice scanner (Aquilion 64, Toshiba Medical Systems, Tokyo, Japan). A total of 90 mL of contrast media was injected from antecubital vein. The fixed-delay technique was used for timing of arterial phase. On maximum intensity projection-arterial phase images, there was no internal carotid artery on the right. At the level of circle of Willis, right anterior and middle cerebral arteries were supplied by the contralateral internal carotid artery by means of anterior communicating artery (Figure 1). On bone window right carotid canal is also absent (Figure 2). Volume rendering technique revealed the absence of right internal carotid artery and collateral circulation via anterior communicating artery clearly (Figure 3). Vertebrobasilar system was normal.

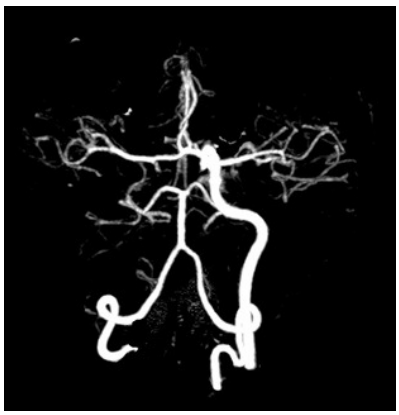

Figure 1: Maximum intensity projection image from anterior aspect shows the absence of right carotid artery. Right anterior and middle cerebral arteries are supplied by anterior communicating artery.

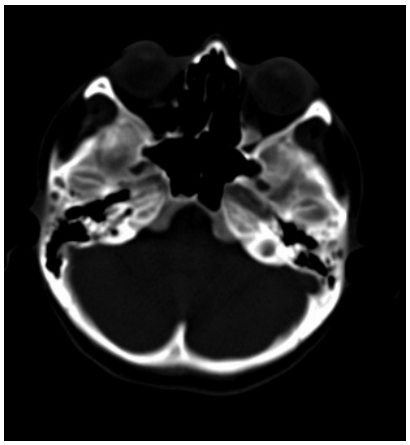

Figure 2: Transverse computed tomography image at the level of carotid canal demonstrates the absence of right carotid canal.

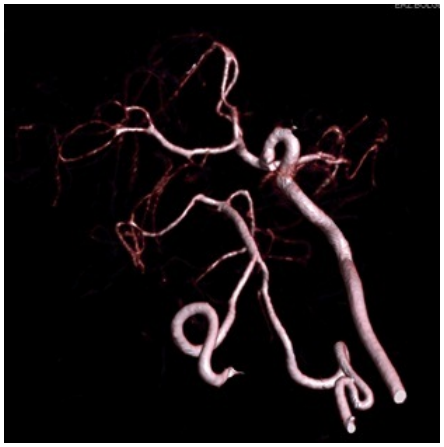

Figure 3: Volume rendering technique from right anterolateral aspect shows the absence of internal carotid artery on the right.

Discussion

Absence of internal carotid artery is a rare anomaly and its etiology is unknown [1]. At the embryologic stage the internal carotid artery develops from the terminal segment of the dorsal aorta and the third aortic arch artery before 24th days. The development of skull base occurs at about the fifth week after that of internal carotid artery. Therefore agenesis of the internal carotid artery will result in development failure of carotid canal [2-4].

Absence of internal carotid artery is generally asymptomatic. This anomaly is generally a unilateral situation but may be bilateral. It is seen generally on the left. The incidence of aneurysms of the circle of Willis is reported to be higher than the normal population [5]. In addition, type 2 neurofibromatosis, coarctation of aorta, some cardiac anomalies, polycystic kidney disease, Klippel-trenaunay syndrome, 22q11.2 deletion syndrome, meningocele, and agenesis of corpus callosum may associate this situation [6-7].

Normally internal carotid artery emerges from the bifurcation of the common carotid artery, and runs upward to the carotid canal in the petrous portion of the temporal bone. From there it enters the cavity of the skull. In the cranial cavity it gives of the branches of anterior cerebral, middle cerebral and posterior communicating and the other smaller arteries. In case of absence these arteries are supplied by collaterals. Three types of collateral circulations have been described. If the anterior communicating artery supplies the anterior cerebral and the posterior communicating artery supplies the middle cerebral artery this type of circulation will be named as fetal type. This one is the most common. For the adult type,the anterior communicating artery supplies anterior cerebral and middle cerebral arteries. For type F, Transcranial anastomosis from the external carotid, contralateral internal carotid artery, or primitive vessels will supply these territories of the brain [2]. In our case both anterior cerebral and middle cerebral arteries were supplied by the contralateral internal carotid artery via anterior communicating artery (adult type collateral circulation). Volume rendering technique clearly demonstrated the absence of right internal carotid artery and collateral circulation at the level of circle of Willis.

Computed tomography angiography serves a very quick and accurate imaging method to show such an anomaly. Pathologies of carotid arteries and arteries of circle of Willis can be visualized by computed tomography angiography clearly. It will also help to differentiate such an anomaly from the other relatively common conditions like thrombosis, atherosclerosis, fibro muscular dysplasia or dissection [5]. It can also reveal the accompanying carotid canal agenesis which further helps to diagnosis. Volume rendering technique provides a global and clear inspection of collateral circulation. It is an easy way to evaluate and demonstrate the anomalous anatomy.

References

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