CT angiography with 64 row multislice CT in Persistent Hypoglossal Artery: a case report

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Persistent hypoglossal artery (PHA) is a well recognized congenital anomaly of anastomosis between internal carotid and basilar arteries that does not regress after postnatal life. This anomaly is sometimes incidentally found at diagnostic angiography, MR imaging or CT scan. We present a case of persistent hypoglossal artery diagnosed incidentally during a head and neck CT scanning. We also describe the course of this rare vascular anomaly and its possible associated clinical implications. Its diagnosis using different imaging modalities is discussed.

Persistent hypoglossal artery (PHA) is a rare vascular anomalous communication between anterior and posterior circulation of the brain. Its general incidence rate is about 0.03% to 0.26% of the population [1]. This vessel usually originates from the cervical part of internal carotid artery (ICA) at the C1-2 level, coursing posteromedially into the hypoglossal canal and anastomosing with basilar artery to supply the posterior circulation [2]. Sometimes, the vertebral arteries are absent or severely hypoplastic. In other times, it is incidentally found during conventional cerebral digital subtraction angiography (DSA). There are some rare possible associations of this anomalous artery such as arteriovenous malformation [3-4], aneurysm formation [5-6], or acute infarct [7-8] in the literature. There are several different diagnostic modalities such as conventional angiography, MRI and MRA, computed tomography (CT) and computed tomography angiography (CTA). We will discuss the potential advantages of 64-row CTA over the other two imaging modalities.

A 44 year-old male patient presented to our neurologic outpatient department due to a disturbing spinning sensation for several years. He suffered from vertigo most severely in the morning, especially when he turned his head. He also had hyperlipidemia and he was a heavy smoker. The physical examination revealed neither significant sensory nor motor deficits except for nystagmus when he turned his head. Under the impression of transient ischemia attack (TIA), a neck vessel duplex study was arranged for him. The study revealed severe stenosis of bilateral vertebral arteries (VA). A neck CT with CTA was then performed. Multiplanar reconstruction (MPR) and volume rendering (VR) reconstruction were also performed as the post-processing technique.

On his neck CT and CTA, an incidental aberrant artery was noted. It originated from left ICA at C2 level and transversed through a dilated left hypoglossal canal into the retroclival space, and ran upward to become basilar artery (Fig. 1a). Hypoplasia of bilateral VAs was also noted (Fig. 1b). There was neither aneurysm formation along the course of this aberrant vessel nor carotid stenosis (Fig. 2). The final diagnosis, left PHA with congenital hypoplasia of bilateral VAs, was confirmed by the typical course of the artery.

DISCUSSION

PHA is the second most common anomalous carotid-basilar anastomosis after persistent trigeminal artery [1]. This aberrant vessel was first described by Batujeff in 1889 [9]. Begg et al. dem-
Persistent hypoglossal artery in CTA

Drostan showed the first case in 1961 [10]. Lie [11] further established the diagnostic criteria [12] similar to our case. The incidence of PHA is 0.03% to 0.26% of the population [1]. The proximal VAs are usually hypoplastic and the ipsilateral VA may be absent. As in our case, a PHA with bilateral VA hypoplasia makes it the main blood supply to the posterior fossa (Fig. 1a).

PHA might be symptomatic. As in our case, the patient has long-term dizziness. Our explanation is that the PHA has a straight course and is fixed between hypoglossal canal and ICA, like a string. As a result, during head turning this artery string may be stretched or kinked at hypoglossal canal and induced insufficient flow to the structures of posterior fossa.

PHA is usually detected incidentally in conventional angiography for other reasons [13-14]. Identification of this variant is very important since aneurysms could occur at the junction of PHA and basilar artery. Besides, carotid stenosis proximal to the origin of PHA could alter the flow to intracranial posterior circulation [5-6]. Cerebral angiography does provide a good resolution of this aberrant vessel but takes the risk to cause neurologic deficits. In contrast, it cannot show the overall anatomic relationship between this aberrant vessel, the adjacent

**Figure 1.** a. Contrast enhanced head and neck CT axial image clearly shows an aberrant vessel across the widened left hypoglossal canal (arrow). The diagnosis of persistent hypoglossal artery was confirmed by the typical course of this vessel. b. Bilateral vertebral artery hypoplasia (arrow) is demonstrated.

**Figure 2.** MIP presentation of left internal carotid artery demonstrates dilatation of proximal ICA proximal to origin of persistent hypoglossal artery (arrow). There is no ICA stenosis.
vessels and the surrounding bony and brain structures. MRI, on the contrary, is not invasive and it can sometimes better delineate the course of the persistent hypoglossal artery. It is not worse than CT in detecting the surrounding neural structures [14].

With the evolution of 64-row multislice CT scanners, some roles of the conventional angiography have been gradually replaced. Unlike conventional angiography, the multi-slice CT and CTA provide a non-invasive way to rapidly delineate not only the whole course of the PHA from its origin using MPR or curved MPR technique [15]. It also clearly shows how the vessel enters the enlarged hypoglossal canal (Fig. 1a). Most importantly, it provides the relationship between this aberrant artery and the aneurysm, arteriovenous malformation, and infarct in those patients who develop these rare complications [3-8]. These advantages make CTA an excellent equipment in diagnosis and surgical planning. Other promising techniques, such as vessel analysis tools with a centerline approach and automatic lumen boundary definition, bone removal with thresholding, or subtraction algorithms might provide a quality analysis of vessels comparable to that of a conventional cerebral angiography [16].

In conclusion, both CT and MRI are equally better than angiography in depicting the associated bony and neural structures around the PHA [2, 14]. They also help to find out two main clinical concerns about PHA - aneurysm formation at the junction of PHA and basilar artery and VA hypoplasia. CT provides high spatial resolution and easy availability although radiation exposure is one major concern. In our case, CTA finding is enough to explain the patient’s symptoms and to exclude aneurysm or carotid stenosis; hence conventional angiography is not needed.

REFERENCE

持久性舌下動脈在六十四排電腦斷層血管攝影下之表現：病例報告

林建宏 1  趙海倫 2  吳泰清 1  曾文盛 1  李美樺 1

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持久性舌下動脈 (Persistent hypoglossal artery) 是一個被認為已相當了解的先天性異常，主要是因在胚胎時在內頸動脈和基底動脈之間的交通沒有退化所造成。這種異常有時在做診斷性血管攝影、核磁共振攝影或電腦斷層時有時會意外發現。我們在這裡提出一個關於在做頭頸部電腦斷層時發現此種血管異常之病例，描述它所行經的途徑，臨床上的重要性，另外用來診斷這種異常的工具也會在文章中討論。