MR Appearance of the Persistent Hypoglossal Artery

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Summary: We describe the MR appearance of the persistent hypoglossal artery incidentally found in a case of known glioblastoma multiforme. On the spin-echo images, an abnormal tubular structure of low intensity penetrating the hypoglossal canal was recognized. MR angiography showed its vascular nature and the anomalous vessel connecting the internal carotid and basilar arteries.

Index terms: Arteries, abnormalities and anomalies; Arteries, hypoglossal

The persistent hypoglossal artery, a persistent carotid-basilar anastomosis, is a rare vascular anomaly. We describe a case of a persistent hypoglossal artery suspected on initial spin-echo magnetic resonance (MR) examination and confirmed with subsequent MR angiography.

Discussion

Carotid-basilar anastomoses represent persistent embryonic circulatory patterns that link the carotid and vertebrobasilar systems. With the exception of extracranial proatlantal intersegmental arteries, these are named according to the cranial nerves they parallel: the persistent trigeminal, otic (acoustic), and hypoglossal arteries. Normally, these anastomoses remain functional for about 7 to 10 days during the early stage of fetal development and then obliterate at the rate the posterior communicating arteries develop (1). Failure of this obliteration results in a persistent embryonic artery.

The persistent hypoglossal artery is the second most common carotid-basilar anastomosis. Its frequency is about one sixth that of the most common one, the primitive trigeminal artery (2, 3), of which the prevalence is 0.1% to 0.2% (4). According to angiographic studies (2–5), the primitive hypoglossal artery originates from the cervical part of the internal carotid artery at the level of C-1 to C-3. After a tortuous course, it penetrates the enlarged hypoglossal canal and joins the lower portion of the basilar artery. When it is large, the proximal vertebral arteries usually are hypoplastic and the ipsilateral vertebral artery may be absent. These findings are consistent with the MR findings in our case. Differentiation between the hypoglossal and the less common proatlantal intersegmental artery on angiographic examination requires careful analysis because these primitive arteries take a similar course (6). The proatlantal intersegmental artery enters the posterior fossa through the foramen magnum, following the course of the vertebral artery. Therefore, differentiation between these primitive arteries on MR will be
easy by demonstrating the foramen through which it passes.

The clinical significance of the persistent hypoglossal artery is unclear. Occasionally, aneurysms develop at the junction of this artery with the basilar artery (7–9). This vascular anastomosis may be of functional importance in patients with carotid stenoses and may provide a pathway for cerebral embolism, as reported in cases of persistent primitive trigeminal arteries (10–12).

Before the advent of MR, conventional angiography was the only method for diagnosing these primitive arteries. Since then, some cases of persistent trigeminal artery have been discovered by means of MR imaging (13–15). As illustrated in our case, when an abnormal tubular structure of low intensity penetrating the hypoglossal canal is encountered on spin-echo imaging, it suggests the presence of a persistent hypoglossal artery. MR angiography is useful for confirming the spin-echo finding and demonstrating the course of the anomalous vessel noninvasively.

References
1. Padget DH. The development of the cranial arteries in the human embryo. 
Contr Embryol 1948;32:205–261
6. Anderson RA, Sondheimer FK. Rare carotid-vertebrobasilar anastomoses with notes on the differentiation between proatlantal and hypoglossal arteries. 
Neuroradiology 1976;11:113–118
7. Udvarhelyi GB, Lai M. Subarachnoid hemorrhage due to rupture of an aneurysm on a persistent left hypoglossal artery. 
Br J Radiol 1963;36:843–847
Neuroradiology 1974;6:277–278
J Neurosurg 1976;45:449–451
10. Waller FT, Simons RL, Kerber C, Kissel IO, Tanabe CT. Trigeminal artery and microemboli to the brainstem: report of two cases. 


