# CASE REPORT

## MR ANGIOGRAPHY IN PERSISTENT HYPOGLOSSAL ARTERY WITH ABSENT BILATERAL VERTEBRAL ARTERIES: A RARE ANOMALY

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**HOW TO CITE THIS ARTICLE:**
Rashmi M. Nagaraju, Bhimarao. "MR Angiography in Persistent Hypoglossal Artery with Absent Bilateral Vertebral Arteries: A Rare Anomaly". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 17, April 27, 2015; Page: 2646-2650.

**ABSTRACT:** Persistent hypoglossal artery (PHA) which is a persistent carotid-basilar anastomosis is a rare vascular anomaly. It is usually found incidentally. We present a case of persistent left hypoglossal artery associated with absent bilateral vertebral arteries in a 62 year male patient presenting with vertigo and giddiness for 1 month. This finding was only incidental. There were no associated findings in this patient.
**KEYWORDS:** Persistent hypoglossal artery, carotid-basilar anastomosis, MR angiography.

**INTRODUCTION:** Anastomoses between carotid and basilar system represent persistent embryonic circulatory pathways linking the anterior and posterior circulation systems. PHA is one of the four carotid-basilar anastomosis. PHA is a rare anomaly and estimated incidence is approximately 0.02-0.1%. It is usually incidentally detected on cross sectional imaging done for a different indication. Rarely it may be a cause for aneuryms, glossopharyngeal neuralgia or paralysis.

**CASE REPORT:** A 62 year male presented with vertigo and giddiness since 1 month. He was referred for MRI brain with MR angiography to look for any intracranial pathology.

MRI of brain with TOF MR angiography of neck and circle of Willis vessels was done with a 0.35 Tesla MRI scanner – MAGNETOM- C by Siemens Healthcare. T2 axial (Fig. 1b), FLAIR axial, T1 sagittal, Gradient axial, FLAIR coronal, DWI and ADC maps and TRUFI axial (Fig. 1a) of posterior fossa were performed. 2D TOF MR angiography of neck and 3D TOF MR angiography of circle of Willis was performed.

There was no evidence of acute infarct or intracranial space occupying lesion. Mild small vessel ischemic changes were noted in both cerebral hemispheres in the form of subtle T2 and FLAIR hyperintensities in deep periventricular and sub cortical white matter. Mild age related neuroparenchymal atrophic changes were noted in the form of prominent ventricular system, sulcal & cisternal spaces and cerebellar foliae. The posterior fossa including brainstem and bilateral cerebellar hemispheres were otherwise unremarkable.

TOF MR angiography (Fig. 2 and Fig. 3a & b) revealed an enlarged vessel arising from terminal cervical portion of left internal carotid artery, arising at the level of C2 vertebral body. It extended superiorly to enter the left hypoglossal canal, which was relatively widened. In the posterior fossa it coursed initially posteromedially and then anteromedially to enter prepontine cistern and continue as basilar artery. The bilateral posterior inferior cerebellar arteries and superior cerebellar arteries were arising from the basilar artery. Both posterior cerebral arteries

originated as terminal branches of basilar artery. Bilateral vertebral arteries were absent. No obvious evidence of occlusion / aneurysm formation noted in the visualized vessels.

This anomalous vessel arising from cervical portion of left internal carotid artery, traversing through left hypoglossal canal and continuing as basilar artery supplying posterior circulation is the persistent hypoglossal artery. It is well demonstrated in MR angiographic images.

**DISCUSSION:** Anastomoses between carotid and basilarsystem represent persistent embryonic circulatory pathways linking the anterior and posterior circulation systems. These are named according to the cranial nerves they parallel: the persistent trigeminal, otic (acoustic), and hypoglossal arteries.

Persistent hypoglossal artery (PHA) is one of the four carotid-basilar anastomosis, which exists in the human embryo for about 7 to 10 days during the early stage of fetal development as a temporary communication between the two longitudinal neural arteries and internal carotid artery (ICA). The longitudinal neural artery later becomes the basilar artery.[1] They usually remain functional and then obliterate at the rate the posterior communicating arteries develop.[2] First the otic artery loses its function and the hypoglossal, trigeminal and proatlantal arteries follow it.[3] Failure of this obliteration results in a persistent embryonic artery.

PHA is a rare anomaly and estimated incidence is approximately 0.02-0.1%,[4] following persistent trigeminal artery (with frequency of ~1-2 %).[5] The persistent hypoglossal artery usually originates from the internal carotid artery at the levels of the C1 through C3 vertebral bodies, courses through the hypoglossal canal, and anastomoses with the basilar artery.[6] A primitive hypoglossal artery does not pass through the foramen magnum. It is associated with hypoplasia of posterior communicating arteries in 79% of cases, and the vertebral arteries in 78% of cases.[7] Definitive diagnosis is based on the recognition of an anomalous artery in the enlarged hypoglossal canal.[8]

The clinical significance of the persistent hypoglossal artery is unclear. Occasionally, aneurysms develop at the junction of this artery with the basilar artery.[8] 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.[8] A persistent hypoglossal artery has been reported to cause glossopharyngeal neuralgia and hypoglossal nerve paralysis.[9]

Cases of persistent hypoglossal artery have been discovered by means of MR imaging as an abnormal tubular structure of low intensity penetrating the hypoglossal canal on spin-echo imaging. MR angiography is useful for confirming the spin-echo finding and demonstrating the course of the anomalous vessel noninvasively.[8,9]

**CONCLUSION:** Persistent hypoglossal artery is a rare anomaly secondary to persistence of embryonic carotid- basilar anastomosis during development. It is usually incidentally detected on cross sectional imaging done for a different indication. Rarely it may be a cause for aneuryms, glossopharyngeal neuralgia or paralysis. MRI with MR angiography provides excellent visualization of this anomaly.

**Fig. 1 (a & b):** T2 TRUFI axial (a) and T2 TSE axial (b) at the level of hypoglossal canal showing an enlarged vessel traversing the left hypoglossal canal, appearing hyper intense on TRUFI and signal void on T2 TSE.

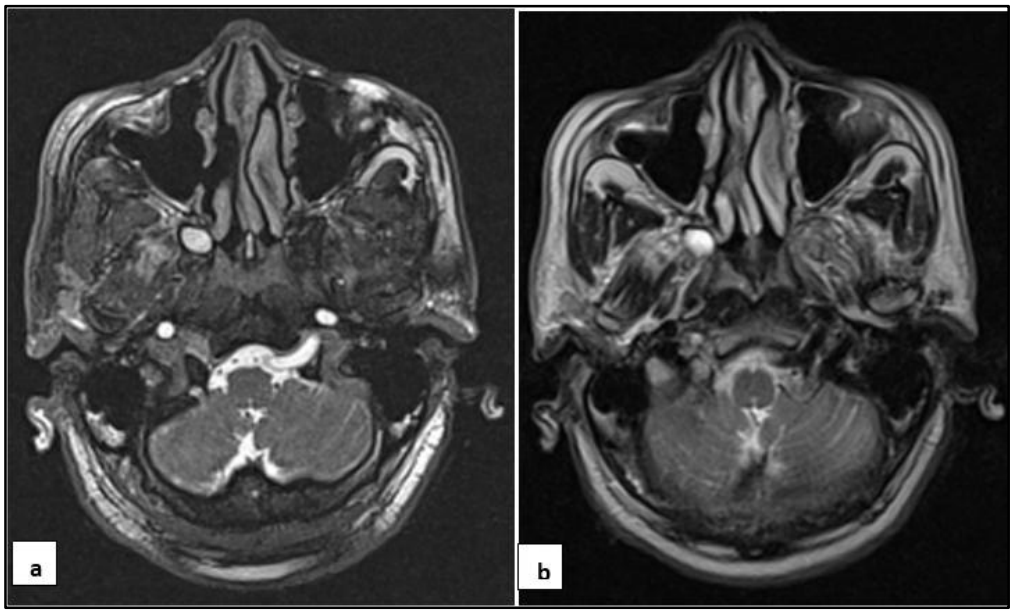


**Figure 1a and 1b**

**Fig. 2:** TOF source image axial at the level of hypoglossal canal showing left persistent primitive hypoglossal artery traversing the left hypoglossal anal.


**Figure 2**

**Fig. 3 (a & b):** MIP- TOF neck vessels (a) and circle of Willis (b) showing left persistent hypoglossal artery arising from cervical portion of left internal carotid artery entering intracranially through hypoglossal canal to continue as basilar artery. Also note absence of both vertebral arteries.

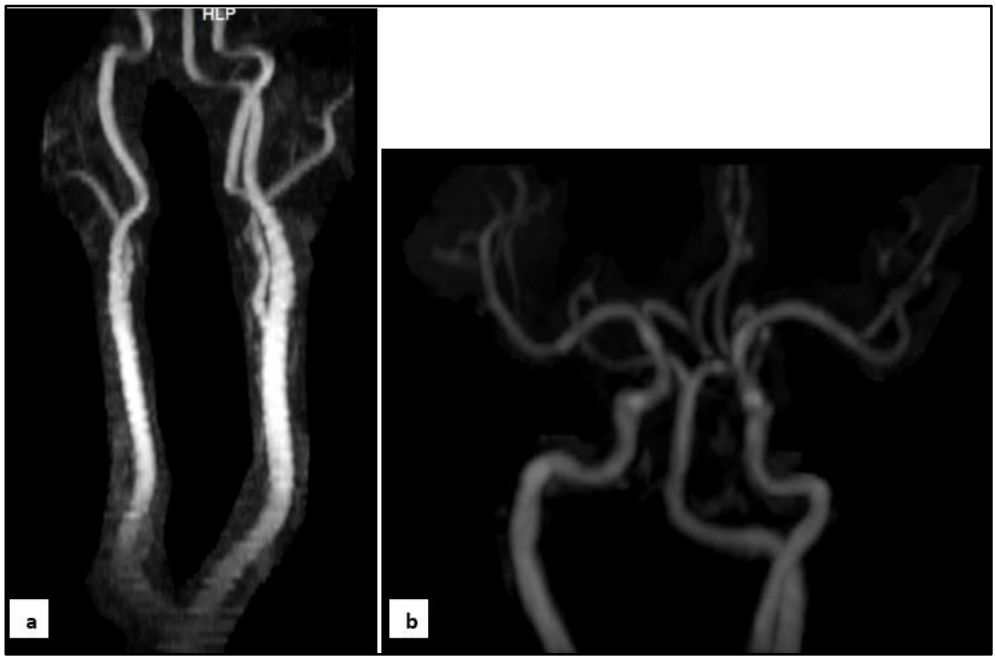


**Figure 3a and 3b**

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Date of Submission: 03/04/2015.
Date of Peer Review: 04/04/2015.
Date of Acceptance: 09/04/2015.
Date of Publishing: 27/04/2015.