

Letter to the Editor Regarding “Anomalous ‘Middle’ Meningeal Artery from Basilar Artery and Implications for Neuroendovascular Surgery: Case Report and Review of Literature”



We read with great interest the article entitled “Anomalous ‘middle’ meningeal artery from basilar artery and implications for neuroendovascular surgery: case report and review of literature” by Sattur et al.¹ They reported an anomalous origin of the middle meningeal artery (MMA) from the basilar artery (BA) in a patient with a subdural hematoma. Their explanation for this anomaly was consistent with a previous report by Kumar and Mishra,² who had explained the anomalous origin of the MMA by the persistent perineural arterial network around the trigeminal nerve and Gasserian ganglion, which anastomoses with branches of both the basilar and stapediale arterial systems. They conjectured that the MMA–BA channel opens up in the absence of a normally developing MMA.² This arterial network could explain the persistence of an anomalous MMA originating from the BA.

The embryological explanation for this anomalous anastomosis is of great interest. As an alternative to these explanations,¹ we would like to present our thoughts on the concept of trigeminal–stapedial anastomosis, which is not new, having been known for many years.³

A persistent trigeminal artery (TA) directly connects the internal carotid artery with the BA. A persistent TA was classified by Saltzman⁴ in 1959 into 3 types: 1) the TA supplies the distal entire vertebral artery system (i.e., bilateral posterior cerebral arteries [PCAs] and superior cerebellar arteries [SCAs]); 2) the TA only

supplies bilateral SCAs, with the bilateral PCAs supplied by the posterior communicating arteries; and 3) the TA supplies the bilateral SCAs and the PCA on the opposite side.

Later, a TA variant exclusively supplying a part of the cerebellum was reported, which was termed a trigeminal-cerebellar artery or variant (Figure 1, purple dotted line). This TA variant supplies a part of the cerebellum normally supplied by the SCA,⁵ anterior inferior cerebellar artery,⁶ or posterior inferior cerebellar artery.⁷ Recently, Komiyama⁸ reported a case with a small TA variant exclusively supplying the brainstem, without direct communication with the BA.

Other types of persistent TAs exist. They do not directly connect with the internal carotid artery but do connect with the MMA³ or ophthalmic artery (OphA).⁹ These variants can be explained by the TA being incorporated with the other embryonic arteries, such as the primitive stapedial artery (SA) and OphA.

The SA is embryologically a part of the hyoid artery. The SA has superior and inferior branches. The anterior branch of the supraorbital branch anastomoses with the OphA via the recurrent meningeal artery. The posterior branch of the supraorbital artery remains a part of the MMA and anastomoses with the ventral pharyngeal artery. Finally, the MMA becomes a branch of the external carotid artery.

The MMA arising from the BA can be understood embryologically as the TA taking over the territory of the intracranial branch of the SA.^{3,10} This variant could be called a trigeminal-stapedial variant (Figure 1, yellow dotted line).

The OphA arising from the BA has also been reported.⁹ This arterial variant is explained by the embryonic connections among the TA, SA, and OphA. This arterial anomaly could be regarded as a trigeminal-stapedial-ophthalmic variant (Figure 1, blue dotted line). Furthermore, another type of persistent TA is a middle or accessory meningeal artery supplying the cerebellum.¹¹ This complicated arterial variant could be explained embryologically by the trigeminal–stapedial–cerebellar anastomosis. Although the concept of these incorporated TAs is not widely recognized, they have been previously reported.^{3,8,12}

As discussed, it is reasonable to consider that the MMA shown in this patient had formed from the primitive SA and TA. Therefore, it would be better to consider this MMA originating from the BA as an embryologically persistent trigeminal-stapedial variant.

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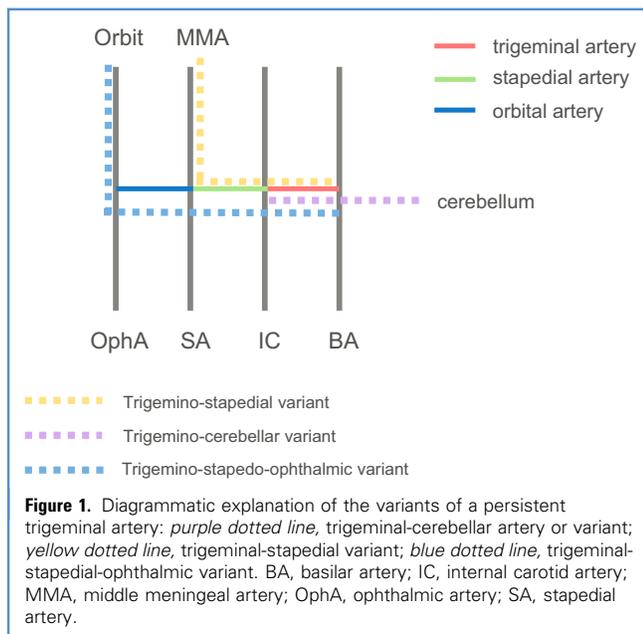
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