

Variant origin of superior thyroid artery, occipital artery and ascending pharyngeal artery from a common trunk from the cervical segment of internal carotid artery

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Abstract We report a case of variant origin of superior thyroid artery (STA), occipital artery (OA) and ascending pharyngeal artery (APA) from the cervical segment of internal carotid artery (ICA) in a 63-year-old male patient, who presented with acute subarachnoid hemorrhage. Four-vessel angiography showed asymptomatic occlusion of ICA giving origin to the anomalous branches. There was common origin of the STA and the OA. The APA originated from the OA. We did not find any other description in the literature on variant origin of STA from the cervical segment of ICA in the presence of a well-developed external carotid artery.

Keywords Variant origin · Superior thyroid artery · Occipital artery · Ascending pharyngeal artery · Cervical segment of internal carotid artery

Introduction

Branches of external carotid artery (ECA) reported to originate occasionally from internal carotid artery (ICA) in the neck, include ascending pharyngeal artery (APA) and occipital artery (OA) [1–6, 8–10, 12–14, 16,

17]. We report a case of variant origin of OA, superior thyroid artery (STA) and APA by a common trunk from the distal end of the stump of an occluded ICA. We did not find any other description in the literature on variant origin of STA from ICA.

Case report

A 63-year-old male underwent cerebral angiography following an episode of acute subarachnoid hemorrhage. No saccular aneurysm was demonstrated in the angiography. His left ICA was occluded at C4 vertebra with well-compensated collateral flow at the circle of Willis. Left carotid bifurcation was lying low at the level of C5 vertebra. Left STA and OA originated on a common trunk from the stump of the occluded ICA (Fig. 1). On tracing the OA distally, origin of APA from the OA was identified (Fig. 2). Left ECA was devoid of any branches in the first few centimeters of its proximal segment. Further its proximal segment showed a horizontal course probably suggestive of an additional anomaly. Left carotid canal was intact on CT scan. Right carotid circulation showed no anomaly.

Discussion

Common carotid artery usually bifurcates into ECA and ICA at the level of C3–C4 [7]. Beyond its origin ICA is divided generally into cervical, petrous, cavernous and supraclinoid segments [4]. Usually no branches originate from the cervical segment of ICA in the neck [4]. Occasionally proatlantal intersegmental artery and hypoglossal artery, which arise from the cervical

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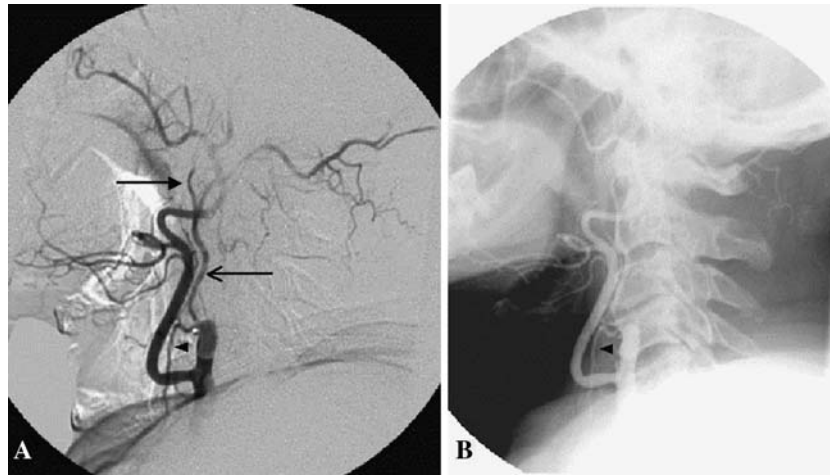


Fig. 1 **a** Left carotid angiogram *lateral view* shows the common origin of the superior thyroid artery (STA) (arrowhead) and the occipital artery (OA) (arrow) from the occluded stump of the internal carotid artery (ICA). Distally origin of the ascending pharyngeal artery (solid arrow) from the OA is seen. Note the

absence of branches in the proximal external carotid artery. **b** Left carotid angiogram *lateral view unsubtracted image* shows the low carotid bifurcation located at the upper border of C5 vertebra. Note the STA (arrowhead) arising from ICA



Fig. 2 Left carotid angiogram in *oblique view* shows origin of ascending pharyngeal artery from OA (arrow) and the thyroid blush (solid arrow) located at the distal end of the STA

segment of ICA, may persist into adult life [5]. Some of the well-known ECA branches reported to originate from the cervical segment of ICA include OA, APA and internal maxillary artery [1–3, 6, 8–10, 12–14, 16, 17]. Very rarely in the absence of ECA, all branches of ECA may originate from the cervical segment of ICA [15].

Occipital artery seems to be the most common ECA branch to originate from the cervical segment of ICA. It was Hyrtl [8], who originally reported origin of OA and posterior auricular artery from a common trunk from ICA. Later Adachi and Hasebe [1] reported anomalous origin of OA on postmortem examination in 1928. Newton and Young [14] were the first to report angiographic demonstration of anomalous OA from ICA. They reported three cases of anomalous origin of OA from the cervical segment of ICA. Among the three cases, one had shown complete occlusion of the proximal ICA. In this case the distal ICA was reformed by OA via collateral circulation from the muscular branches of the vertebral artery. In a similar case reported by Bowen et al. [3], patency of the occluded segment of ICA was successfully restored with carotid endarterectomy.

Superior thyroid artery is the first branch to originate from ECA [4]. It arises from the anterior wall of proximal ECA and courses down to supply the apex of the ipsilateral thyroid lobe. It may have a common origin with lingual artery. This common stem is called thyrolingual trunk. Occasionally STA may originate from common carotid artery [7]. Hayashi et al. [7] from an analysis of carotid arteries in 49 cadavers found 70% of STA originating from the anterior surface of ECA and 30% from common carotid artery. Origin of STA from ICA to our knowledge has not been previously reported in the literature. We not only observed the unique origin of STA from ICA but also its common origin with OA in our case.

Ascending pharyngeal artery is the second most common branch after OA to originate from the cervical segment of ICA [6, 9]. In the series by Hayashi et al. [7],

APA originated from the medial wall of ECA in 66% specimens, below the origin of lingual artery in 9% of specimens and from the carotid bifurcation in 2% of specimens. In 2% of specimens, the APA was found to arise directly from ICA [7]. APA often seems to share common origin with OA [11]. In Hayashi et al. [7] series the incidence of origin of APA from OA was 19%.

There is a better understanding of the embryological basis of occurrence of persistent proatlantal intersegmental artery and persistent hypoglossal artery from cervical ICA [5]. The embryology of variant origin of OA and the other external carotid branches is poorly understood although Lasjaunias et al. [11] hypothesize that OA is a remnant of proatlantal intersegmental artery. Apart from the anomalous origin of STA, OA and APA from the cervical segment of ICA, the other anomaly we found in our patient was the low bifurcation of left common carotid artery. Although common carotid artery often bifurcates at the level of C3–C4 disc, occasionally it may do so at a higher or lower level [4]. We do not know whether there is any embryological basis for the association between anomalous origin of ECA branches and low carotid bifurcation.

Lasjaunias et al. [11] have described in detail the phylogenetic and embryological basis of common origin of APA and OA as well as their origin from the cervical segment of ICA. They describe a pharyngo-occipital system located at the craniocervical junction consisting of APA and OA, since they together supply the three cervical somites C1, C2, C3 and the third branchial arch. APA in its most complete form consisting of both pharyngeal and neuromeningeal divisions originates typically from ECA, which is a derivative of ventral pharyngeal artery. In its incomplete form the pharyngeal division of APA originates from ECA while the neuromeningeal division originates from the OA [11]. Exceptionally the pharyngo-occipital system and therefore both APA and OA may arise from ascending cervical artery. According to Lasjaunias et al. [11], these features may represent independence of the pharyngo-occipital system from ECA and therefore explain the variability in the origin of APA and OA as well as their common origin. Further Lasjaunias et al. [11] consider that cervical segment of ICA and APA developmentally share a relationship with the third aortic arch. The cervical segment of ICA is derived from the third aortic arch and APA may represent the dorsal vestige of third aortic arch [11]. This may explain the origin of APA from cervical segment of ICA.

Though Lasjaunias et al. [11] acknowledge the variability of origin of STA from ECA, CCA or lingual artery, they do not deal with the possibility of origin of STA from the cervical segment of ICA which further

highlights the unique nature of our report. Perhaps an understanding of the superior laryngeal system described by them, which supplies the fourth branchial arch derivatives, may offer an explanation for the unusual origin of STA from ICA. According to Lasjaunias et al. [11] origin of superior laryngeal artery is extremely variable and it may arise directly from STA, ECA or APA. SLA gives rise to ventral and dorsal branches, which share extensive collateral communication with branches of STA. From these factors, it seems possible to conceive an origin for STA from pharyngo-occipital system and thereby cervical segment of ICA.

Conclusion

We report a case of variant origin of STA, OA and APA from the cervical segment of ICA in association with low carotid bifurcation and occluded ICA. We did not find any other description in the literature on variant origin of STA from the cervical segment of ICA in the presence of a well-developed ECA.

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