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Variations in the branching pattern of the External Carotid Artery

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Abstract:
Objective: *To study the variations in the branching pattern of the external carotid artery, being the principal artery nourishing almost the head and neck (external to skull) and report any deflections from the normal branching pattern described in the text books of Anatomy.*
Materials, methods and results: *Ina sample study of 30 cadavers at NRI medical college, Chinnakakani, Andhra Pradesh (24 males and 6 females), we have found variations in the various branches and reported (figures).*
Keywords: *external carotid artery (ECA), common carotid artery (CCA), Superior thyroid artery, ascending pharyngeal artery, lingual artery, facial artery, occipital artery*

I. Introduction

The external carotid artery is the principal arterial supply of almost all the structures in the head and neck and a detailed knowledge of its branching pattern is of considerable significance in planning head and neck surgery.[1] This also necessitates accurate interpretation of radiological images and proper planning of the surgical steps taken during the exploration of head and neck such as carotid endarterectomy, aneurysm repair, carotid angiogram and radical dissection of the lymph nodes. [2,3,4] The proper identification of the branches of the external carotid artery is imperative.[5,6]Branches of ECA are key landmarks for adequate dissection for exposure and appropriate placement of cross clamps on the carotid arteries or catheterization.[7]The patterns of branching of ECA show ethnic differences.[8]High variability of the carotid arterial system in the Kenyan population has been reported.[9,10,11]

II. Materials and Methods and Results

30 cadavers (24 males and 6 females) ages ranging from 35-50 years were dissected at the Anatomy dissection hall, NRI Medical College, Chinnakakani, Andhra Pradesh. One specimen showed a common stem arising from ECA trifurcated into ascending pharyngeal, lingual and facial arteries (Fig1). Ascending pharyngeal artery arose higher than lingual artery on one specimen and it branched from occipital artery as slender branch in one specimen (Fig.2a and 2b). In one specimen a short stem was given off from ECA which divided into two branches: one continued as the superior thyroid artery and the other trifurcated into ascending pharyngeal, lingual and facial arteries (Fig.3). In one specimen, lingual artery and facial artery formed a common linguofacial trunk. Facial artery in one specimen was given off at the level of the angle of the mandible much higher than its normal level of origin (Fig4a and 4b). Occipital artery branched off as a common trunk with posterior auricular artery in two specimens (Fig.5a). In another specimen, it arose as an independent branch below the linguofacial trunk (Fig.5b). In one specimen it was in between the superior thyroid and lingual arteries. All of the variations were observed on the left side.

III. Discussion

The ECA is one of the terminal branches of CCA usually given off at the level of the upper border of thyroid cartilage, corresponding to C3-C4vertebral level.[12] It is anteromedial to the internal carotid artery at its origin in the carotid triangle and ascends to the parotid gland and terminates into maxillary and superficial temporal arteries at the level of the neck of the mandible[12]. It gives off superior thyroid, lingual, facial, ascending pharyngeal, occipital and posterior auricular arteries in the neck. In a radiological study in different age groups, it is reported that the origin of ECA can be anywhere between C2-C6 vertebral levels[13]. In our present study the ECA was given of at the usual level in all the specimens. The variations observed in the present study are linguofacial trunk, trifurcation of a common trunk and higher and lower level of origins of some branches.

ECA‘s development is a complicated process of angiogenesis and remodelling which includes annexation and regression of vessels. The development of hyostapedial artery which links the neural crest arterial system to the ventral pharyngeal arterial system is an important event in the development of external carotid artery. Signals involved in annexation and regression are not always synchronized which results in various anatomical variations[14]. A case report was found which showed an anomalous glandular branch arising directly from the ECA, on the medial aspect, 1.2 cm above the bifurcation of CCA. It exclusively supplied the submandibular salivary gland [15]. In a study done among 95 cadavers, a case was found to have glandular branches directly given off from the ECA to the parotid salivary gland. They also report about unusual origin and course of the right facial artery which arose from the ECA just above the angle of the mandible and passed directly on to the face crossing the posterior border of mandibular ramus and along the posterior pole of the superficial part of the submandibular salivary gland[16].

IV. Conclusion

The external carotid artery shows high frequency of variations comprising early bifurcation, trifurcation, quadrifurcation and short common stem. These variations may lead to inadvertent injury and cause confusion in interpretation of angiograms. Preoperative evaluation is recommended[17]. In the present study we did not come across quadrifurcation. Bifurcation, trifurcation and higher and lower origin of some branches were observed.

For reconstruction purposes, the Facial Artery Musculo-Mucosal (FAMM) flap was introduced. But its use is limited by variations in the course of the facial artery. Therefore, application of knowledge of the precise course and branching pattern of the facial artery is required for construction of FAMM flap and its successful utilization[18, 19].

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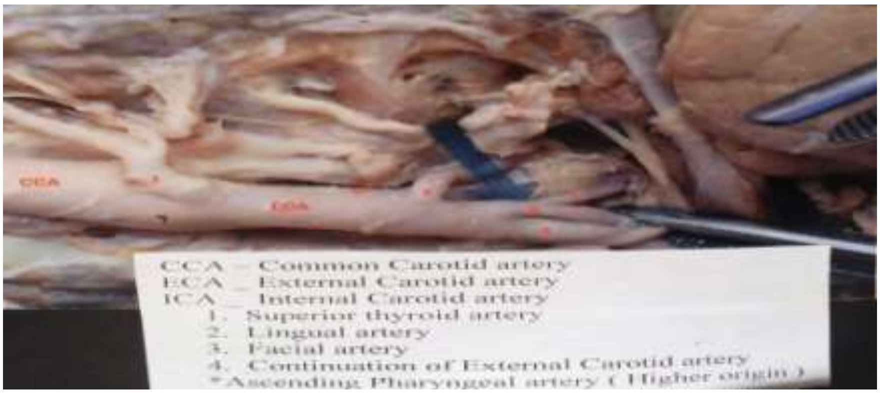
Figures. 1.

A common trunk (*) trifurcating in to lingual (2), ascending pharyngeal (3) and facial (4) arteries.

2.a



2b.

Ascending pharyngeal artery (1) stemming from occipital artery (2)

3.

A common trunk *giving off superior thyroid artery (1) before trifurcating.

4a.

Linguofacial trunk (2)

4b.

High origin of the facial artery* close to the angle of the mandible

5a.

A common occipito auricular trunk dividing in to occipital (1) and posterior auricular (2) arteries.

5b.

Low origin of occipital artery* below linguofacial trunk