Variation in the branching pattern of carotidartery in the neck region: Report from a tertiary medical college of Bihar

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DOI Number: 10.48047/NQ.2023.21.2.NQ23015 **Neuroquantology 2023; 21(2):142-148**

INTRODUCTION

In the neck, the common carotidarteryisre presented by a more or less straight line from the sternoclavicular joint to a point just behind the condyle of themandible. At the level of the upper border of thyroid cartilage, it divides into theexternal and internal carotid arteries. In the carotid triangle, both these arteries ariseand ascend. The external carotid artery (ECA) along with its branches caters to thehead and neck region. It is the major supply channel to this region. To serve thispurpose, it gives out 8 branches, namely the superior thyroid artery (STA), ascendingpharyngeal artery (APA), lingual artery (LA), facial artery (FA), occipital artery,posterior auricular artery (PAA), superficial temporal artery, and maxillary artery. Italso gives out collateral branches to sustain vascular supply to this region of brain byforming connections of these branches of ECA with the cranial branches of internal carotidartery (ICA) and vertebralarteries[1].

Studying this anatomy of the carotidarteries is of utmost importance to surgeons operating in head and neck region. As any variation in ECA and ICA area symptomatic, anomalies, if any, are usually an incident alfinding on academic is section of cadavers or imaging studies for investigation purpose. While performinghead and neck surgeries, it is inevitable to differentiate ECA from ICA to preventerroneous ligation oftheICAthatmay lead tohemiparesis.

In cases of neck trauma, these arteries sustain injury leading to severe bloodloss and these cases require immediate surgical intervention. [2, 3]. Blunt trauma tocarotid artery and its branches lead to formation of pseudoaneurysms. The majorincidence of these complications are seen affecting branches of ECA more than theECA itself [4]. Further, the knowledge of branching pattern is applied for cases of intra-arterialin fusion chemotherapy,

carotids tenting, endarterectomy and other radiological and surgical procedures involving head and neck region[5-11].

Hence, a comprehensive knowledge of the branching pattern along with the possiblevariation of the ECAisinevitable forthe surgeonsaswell asthe radiologists. This will help improve the success rate of concerned procedures and reduced incidence of vascular complications. The current study was planned with the objective to know the variation in the origin and branching pattern of common carotidartery, external carotidartery and internal carotidartery in the neck region.

METHODOLOGY

An observational study was planned and conducted as a part of post-graduatethesis work under the Department of Anatomy of the Darbhanga Medical College &Hospital, Bihar. Data was collected over a period of 18 months, November 2014 toApril 2016. The study was approved by the Institutional Ethics Committee. Informedconsent forms were taken from each of the participating patient. Patient who were know to be allergic or contraindicated to receive contrastagentsorthosewithimpairedrenalfuncti onwereexcludedfromthestudy. Patients who refused to participate were also excluded from the study.

The study envisages 20 cadavers and 30 patients. Cadavers were dissected foracademic purpose and information was obtained while patients were referred to theradiology department, DMCH and advanced diagnostic centre, Darbhanga for MR angiography of carotid vessels. Following information were noted during dissection or from the recors of the patients: a) Level of division of common carotid artery, b)Relative position of internal carotidartery and external carotidarteryjust after bifurcation, c) Origin of superior thyroid artery and lingual artery, d) Origin of lingualartery and facialartery, e)Origin of ascending pharyngealartery, f)Origin of posteriorauricular artery, andg) Origin ofoccipitalartery.

Any variations noted in the origin, path and branching of the ECA were documented and photographs were taken. The data was computed and analyzed usingMicrosoftExcel.

RESULTS

A total of 50 cases were included in the study that comprised of 20 cadavers and 30patients. The age of the cases ranged from 32 to 72 years with a mean of 54.74 yearsand a standard deviation of 9.61 years. Among 20 cadavers, 13 were male and 7 were female cadavers. Among 30 patients, 19 were male and 11 were female patients.

Hence, there was a male preponderance in the current study. Among the 46 cases,level of bifurcation was normal, that is at the upper border of thyroid cartilage. Thebifurcation was at higher level for 3 cases and at lower level for the remaining 1 case.[Figure 1-4]Out of 3 caseswith higher bifurcation, 2 were among patients. Rest 1case and the case with lower bifurcation was noted in cadaver. Relative position ofECA and ICA was normal in 49 out of 50 cases. In one cadaver, ECA was noted to beplaced laterally. In present study the origin of superior thyroid artery and Lingualartery was noted to be from a common trunk in 2 (4%) of cases. [Figure 5-6] Apartfromthese,no variationwasnotedin theorigin ofother branches of ECA.

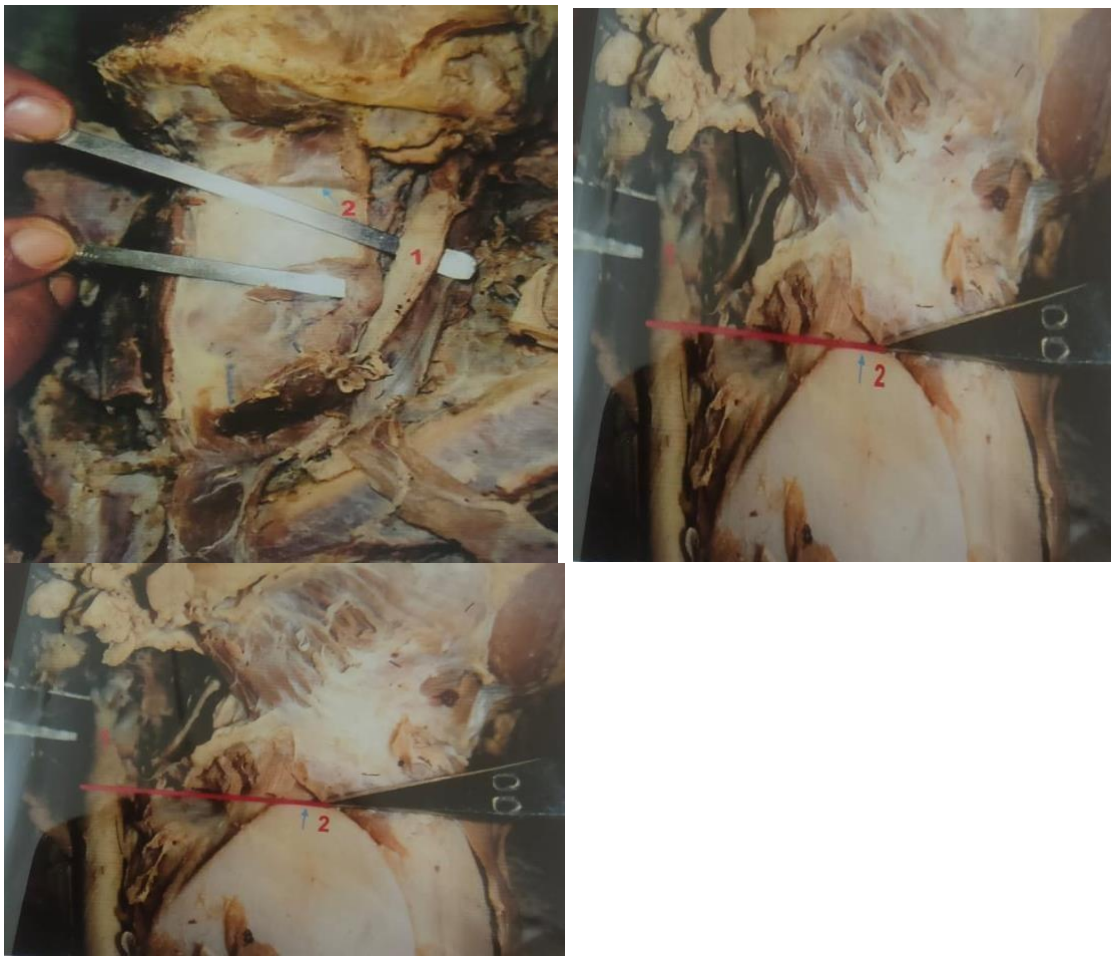

Figure 1-3: High bifurcation of common carotid artery [1 - CCA, 2 - upper border ofthyroidcartilage]

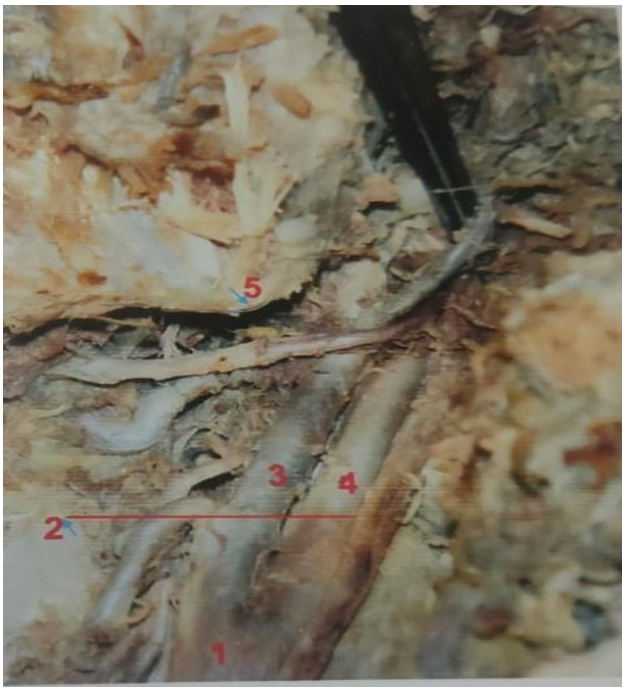

Figure 4: Low bifurcation of CCA [1 - CCA, 2 - upper border of thyroid cartilage, 3 -ECA,4 - ICA, 5 - Angleof mandible]

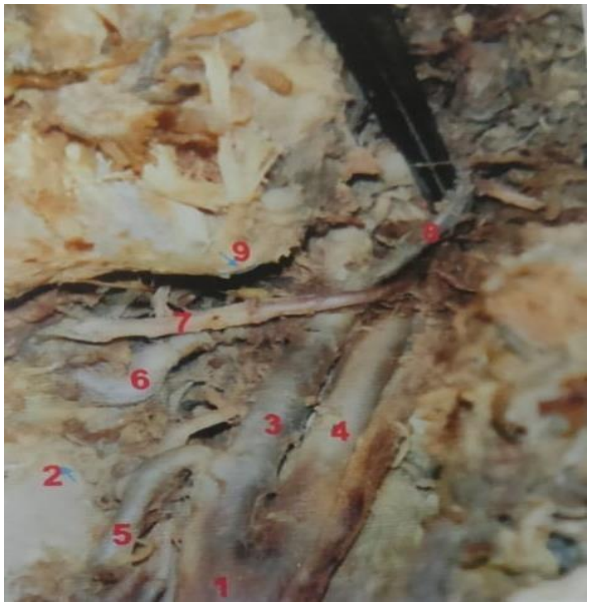

Figure 5: Separate origin of STA and LA on left side [1 - CCA, 2 - Upper border ofthyroid artery, 3 - ECA, 4 - ICA, 5 - STA, 6 - Ungal artery, 7 - Hypoglossal nerve, 8 -Occipitalnerve, 9- Angleof mandible]

Figure 6: Common origin of STA and LA on right side [1 - CCA, 2 - Common trunkofSTA andlingualartery,3-ECA, 4-ICA,5-STA, 6-lingualartery]

DISCUSSION

The most important vascular supply of the region to head and neck is formed by Common Carotid Artery(CCA) along with it send-branches, ECA and ICA. Bifurcation as high as the hyoid bone have been reported before. Variations in the bifurcation of CCA have been reported across the globe.[12,13] They have reported a higher bifurcation of CCAbilaterally, about 1cm above the level of hyoid bone.Normally the ascending pharyngeal, occipital and posterior auricular branches are known to a rise form the ventral aspect of the ECA, but study have reported caseswhere these branches arise from the dorsal aspect. [14] Origin of the superior thyroidartery from CCA instead of ECA has been reported very commonly. [15] Kishve et alhave reported origin of the linguofacial trunk and occipital artery simultaneously withECA and ICA. [16] In the current study, ECA was noted to be placed laterally in 1 outof 50 cases. Also, the superior thyroid artery and Lingual artery was noted to haveoriginated from a common trunk in 2 (4%) of cases. Apart from these, no variation was noted in the origin of other branches of ECA.

There are numerous evidences in the literature proposing that anatomy of externalcarotid artery variesin a significant proportion of population. Adetailed knowledgeof these possible variations is quintessential for the anatomists as well as the surgeons.Also, it is has role to play in the pathogenesis of carotid atheromatous disease along with management of this condition by carotids tenting and endarterectomy [17].Various researchers have studied the carotid bifurcation. Higher levels of carotidbifurcation have been reported in many studies. [18-22] While lower levels of bifurcation also have been reported by the some of these authors. [18-24] Overall,higher level bifurcation is more frequently reported than lower bifurcations. In thecurrent study, 6% of the cases were reported to have higher bifurcation while lowerbifurcation was noted inonly one case. Hence, our study also has more cases of higherbifurcation than lower one.

CONCLSUION

Hence, it has been known with evidence now that the branching pattern of the ECAvaries considerably and a precise understanding of the anatomy of all the possiblevariations will

enhance the outcome of various surgical procedure in the neck regionand will helpin reducingmorbidity and mortality following these procedures. Studyof the vasculature structure of the individual before performing any related procedure will help to avoid injury to vital structures while surgery in the neck or head region.

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