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## ABSTRACT

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BACKGROUND: Common carotid artery divides into external and internal carotid arteries lateral to upper border of thyroid cartilage. External carotid artery supplies structure of head and neck region by its eight named branches. Superior laryngeal artery usually arises from the superior thyroid artery which is a branch of external carotid artery. In the present case we report a rare variation of tortuosity of external and internal carotid arteries and variant origin of superior laryngeal artery.

METHOD: The anterior triangles of neck of 60-year-old male cadaver were studied during routine dissection for first year M.B.B.S students. RESULTS: On right side we have found high level bifurcation of common carotid artery with extremely tortused internal and external carotid arteries which were "s" shaped. We also observed superior laryngeal artery originated directly from external carotid artery on the same side. These variations were compared with those reported earlier.

CONCLUSION: The awareness of these variations may have proved to be paramount important to radiologists during angiography and to surgeons to avoid complication during surgery in these regions.

KEYWORDS : External carotid artery, Internal carotid artery, Superior laryngeal artery.

## Introduction

The main arterial supply to the head and neck is from common carotid artery, external carotid artery and internal carotid artery. During radical neck surgery common carotid arteries define the plane of the dissection in head and neck surgery (Standring Susan et al., 2005). At the level of intervertebral disc between the third and fourth cervical vertebrae lateral to the upper border of the thyroid cartilage, common carotid artery bifurcates into internal and external carotid arteries (Ord R.A. and Ward-Booth R.P, 1986).

The external carotid artery supplies the exterior of the head, the face, and the greater part of the neck. It first lies anteromedially to the internal carotid artery in the carotid triangle, as it ascends it becomes anterolateral to the internal carotid artery and then passes upward, forward and then inclines backward to the neck of the mandible and within the parotid gland divides into the superficial temporal artery and maxillary artery. It has eight named branches distributed to the head and neck, among which ascending pharyngeal artery, superior thyroid artery, lingual artery, occipital artery and facial artery arise in the carotid triangle (Ord R.A. and Ward-Booth R.P, 1986). Superior laryngeal artery generally originates from the superior thyroid artery but occasionally it arises directly from external carotid artery reported in 32% of cases (Bergman Ronald A, (1988).

The internal carotid artery supplies the brain, the eye, the forehead, and part of the nose. It ascends in the neck embedded in the carotid sheath with the internal jugular vein and vagus nerve. At first it lies superficially; it then passes deep to the parotid salivary gland.

The internal carotid artery leaves the neck by passing into the cranial cavity through the carotid canal in the petrous part of the temporal bone. It then passes upward and forward in the cavernous venous sinus without communicating with it. The artery then leaves the sinus and passes upward again medial to the anterior clinoid process of the sphenoid bone. The internal carotid artery then inclines backward, lateral to the optic chiasma, and terminates by dividing into the anterior and the middle cerebral arteries (Ord R.A. and Ward-Booth R.P, 1986).

In the literature, a few variations in origin have been reported for both arteries but the combination of variations reported in this case has not been previously described, to the best of our knowledge.

vessels is of great importance in radiological examinations and interventional procedures to avoid complications during surgery in the cervical region.

### **Case report**

The anterior triangles of neck region of a properly embalmed and formalin fixed 60-year-old male cadaver were studied during teaching the M.B.B.S. students in the department of anatomy at University Science of Medical College, New Delhi, India. Using conventional dissection techniques according to guidelines of "Cunningham's Manual of Practical Anatomy" volume two, fifteenth edition (Romanes G. J, 1998) the skin, superficial fascia and deep fascia were removed systematically on both sides. Carotid triangles were dissected. Common carotid artery divided into external and internal carotid artery lateral to the upper border of the thyroid cartilage, level with the intervertebral disc between the third and fourth cervical vertebrae. In one case we found an unusual tortuosity ("S"-shape) of both carotid arteries on right side. We have observed extremely tortuse course of internal carotid artery with horizontal "s" shaped loop and external carotid artery with usual "s" shaped loop (Fig.1 and2) Special attention was given to the branching pattern of the external carotid artery. Superior thyroid artery, lingual and facial arteries originated from its anterior surface. Origins of the occipital and posterior auricular arteries from its posterior surface and the ascending pharyngeal artery from its medial surface were also observed. The maxillary and superficial temporal arteries were its terminal branches within the parotid gland. Unusual origin of Superior laryngeal artery from external carotid artery instead of superior thyroid artery was also reported. (Fig. 1). Following fine dissection, the external carotid artery, its branching pattern, origin and course of internal carotid artery in the neck were documented by taking photographs. No variations were observed on the left side carotid system.

## DISCUSSION

"Tortuosity" is described as "S" or "C"- shaped elongation or undulation of vessels. Kinking was defined as an acute angulation of one or more segments of the vessel, usually associated with functional or organic narrowing. Coiling was defined as a redundant elongation of the vessels, creating an exaggerated s- shaped curve or circular configuration (Weibel and Field W.S, 1965).

An increased prevalence of kinking in patients with arterial hypertension was reported. Morphological variation may be the result of raised endoluminal pressure and parietal tension due to

Awareness of detailed and the topographic anatomy of these

arterial hypertension (Del Corso L et al., 1998; Pancera P et al., 2000; Schep G et al., 2002).

In the present case we found the "S" shaped tortuosity of external and internal carotid arteries. Study of Avadhani Ramakrishna et al (2012) showed "Shaped tortuosity of common and external carotid arteries while Gupta Ashish et al (2005) showed tortuous common carotid artery.

Avadhani Ramakrishna et al (2012) studied a rare case of multiple bilateral anomalies of carotid arteries. They observed anomalous origin of the superior thyroid artery and linguofacial trunk on both sides and unusual tortuosity of "Shaped common and external carotid arteries.

Gupta Ashish et al (2005) reported tortuous common carotid artery as a cause of dysphagia. They studied a case of 82 year old woman in outpatients and have found only one case in which after surgically resection of redundant part of artery, dysphagic symptoms resolved completely.

The human larynx receives its major blood supply from the superior laryngeal artery. The deviation in the origin and morphology of superior laryngeal artery is important during the transplantation of the larynx and laryngeal reconstruction.

Murlimanju B. V et al (2012) studied variant origins of arteries in the carotid triangle. They observed the origin of left superior laryngeal artery from the external carotid artery instead of the superior thyroid artery in a 70year-old man cadaver.

Soubhagya R. Nayak et al (2011) have classified the origin of superior laryngeal artery into four types in which the type III is Superior Laryngeal Artery arises directly from the external carotid artery (12.1%).

Lang et al (1987) have found that the external carotid artery gave the superior laryngeal artery only in 6.8% of cases.

Above studies of Murlimanju B. V et al (2012), Soubhagya R. Nayak et al (2011), Lang et al (1987) correlates with our study stating origin of Superior Laryngeal Artery directly from the external carotid artery.

#### Embryology

Embryological basis of above variation is not clear but anatomical consequences have important clinical implication. External carotid artery arises from ventral aorta and internal carotid artery from dorsal aorta. Embryogenesis of such a combination of variation may be due to divergence in annexation and regression during angiogenesis (Harsha B. Rand Dakshayani K. R 2012).

#### Conclusion

In adults, carotid artery tortuosity is considered a risk factor for stroke but are not treated unless symptomatic. Course, variations and angulation of the carotid arteries produce changes in the laminar flow, that lead to swirls which usually evolve all the way to strictures and stenosis. Dysphagia due to common carotid artery tortuosity is also observed.

Cerebral infarction may occur due to these morphological variations even in the absence of atherosclerosis.

Therefore, it is necessary to understand the anatomy of these vessels and its variations in interventional procedures and to avoid confusion in interpretation of data during magnetic resonance imaging, duplex ultrasonography and contrast arteriography. Surgeons should aware of these abnormal origins of superior laryngeal artery while performing thyroidectomy, laryngectomy and glossectomy.



FIG-1: Showing tortuous "s" shaped right external carotid artery.

**CCA-** Common carotid artery, ICA- Internal carotid artery, ECA-External carotid artery,

**STA-** Superior thyroid artery, SLA- Superior laryngeal artery, FA-Facial artery,

**PAA-** Posterior auricular artery, HN- Hypoglossal nerve, TG- Thyroid gland.



# FIG-2: Showing tortuous "S" shaped right internal and external carotid arteries.

**CCA-** Common carotid artery, ICA- Internal carotid artery, ECA-External carotid artery,

#### HN-Hypoglossal nerve.

#### References

- 1. Standring, Susan., Johnson, D., Ellis, H., Collins, P., (Eds.). (2005).Gray's Anatomy, (39th Ed.). (543–544). London: Churchill Livingstone.
- 2. Ord, R.A., Ward-Booth, R.P. (1986). Anomalies of the common carotid artery: A rare complication of radical neck dissection. Br J Oral Maxillofac Surg, 24, 405-409.
- Bergman, Ronald. A. (1988). Compendium of human anatomic variations. (65). Baltimore. Urban and Schwarzenberg.
- Romanes, G. J. (1998) In: Head and neck and brain. Cunningham's Manual of Practical Anatomy. (15th ed). (3) (128-135). New York: Oxford medical publications.
- Weibel, Field, W.S. (1965). Tortuosity, coiling and kinking of the internal carotid artery. I. Etiology and radiographic anatomy. Neurology, 15, 7-18.
- Weibel, Field, W.S. (1965). Tortuosity, coiling and kinking of the internal carotid artery. II. Relationship of morphological variation to cerebrovascular insufficiency. Neurology, 15, 462-8.
- Del, Corso. L., Moruzzo, D., Conte, B., et al. (1998). Tortuosity, Kinking and coiling of the carotid artery: Expression of atherosclerosis or aging? Angiology, 49, 361-71.
- Pancera, P., Ribul, M. (2000). Prevalence of carotid artery kinking in 590 consecutive subjects evaluated by Echocolordoppler. Is there a correlation with arterial hypertention? J Intern Med, 248, 7-12.
- Schep, G., Bender, M.H., van de, Tempel.G., Wijn, P.F., de Vries, W.R., Eikelboom, Bc. (2002). Detection and treatment of claudication due to functional iliac obstruction in top endurance athletes: A prospective study. Lancet, 359, 466-73.
- 10. Avadhani, Ramakrishna., Chakravarthi, Kalyan. K. (2012). Multiple Bilateral Anomalies of Carotid Arteries A Case Report. Nujhs, 2(3), 2249-7110.
- Ashish, Gupta, Marc, C. Winslet. (2005). Tortuous common carotid artery as a cause of dysphagia. J R Soc Med, 98, 275–276.
- Murlimanju, B. V., Latha, V. Prabhu., Pai, Mangala. M., Dhanya, Jayaprakash. Saralaya, Vasudha. V. (2012). Variant Origins of Arteries in the Carotid Triangle - A Case Report. Chang Gung Med J, 35 (3), 24-27.

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- Soubhagya, R. Nayak, Ashwin, Krishnamurthy, Latha, V. Prabhu, Bhagath, Kumar. Potu, Ishwar, B. Bagoji, Jiji, PJ and Ganesh, Kumar. Chettiar. (2011). Variable Origin of the Superior Laryngeal Artery and Its Clinical Significance. Al Ame en J Med Sci, 4 (1), 69-74.
- 14. Lang, J., Nachbaur, S., Fischer, K., Vogel, E. (1987). The superior laryngeal nerve and the
- Hang, J., Holdard, S., Holen, R. (2012). (1997). (1997). In Superior Laryngeal Artery. Acta Anat (Basel), 130, 309–318.
  Harsha, B. R., Dakshayani, K.R. (2012). A Bilateral Anomalous Origin of Superior Laryngeal Artery from External Carotid Artery. Anatomica Karnataka, 6 (3), 94-97.