International Journal of Anatomy and Research,
Int J Anat Res 2017, Vol 5(1):3421-25. ISSN 2321-4287
DOI: https://dx.doi.org/10.16965/ijar.2016.493

Original Research Article

AN ANATOMICAL STUDY ON THE ORIGIN AND LENGTH OF THE SUPERIOR THYROID ARTERY IN ADULT HUMAN CADAVERS WITH ITS CLINICAL SIGNIFICANCE

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ABSTRACT

Background and Aim: To study the variations in the site, mode, and the level of origin of the superior thyroid artery.

Materials and Methods: This study was done in twenty five adult human cadavers. The superior thyroid artery was dissected on both sides and the following parameters including the source of origin, mode of origin and length of the artery till it's termination into branches was noted.

Results: In present study, the superior thyroid artery arose from the external carotid artery as a single trunk in 48% of specimens and its average distance of origin above the level of carotid bifurcation was 4.7mm. It arose as a single trunk at the level of bifurcation of common carotid artery in 44% specimens and from the common carotid artery below its bifurcation in 4% of specimens and the average distance of its origin below the level of carotid bifurcation was 13mm . In 2% arises from external carotid artery as thyrolingual trunk and in 2% as thyrolinguofacial trunk . The average distance of origin of superior thyroid artery below the level of greater cornu of hyoid bone was 1.25 cm and its average length was 3.3 cm.

Conclusion: The above information will be useful as reference for surgical procedures such as radical neck dissection and others like catheterisation, reconstruction of aneurysm, carotid endarterectomy and interventional radiology.

KEY WORDS: Superior thyroid artery, common carotid artery, external carotid artery, carotid bifurcation, thyrolingual trunk, thyrolinguofacial trunk.

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Access this Article online

Quick Response code

DOI: 10.16965/ijar.2016.493

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 01 Dec 2016
Peer Review: 02 Dec 2016
Revised: None
Accepted: 04 Jan 2017
Published (O): 31 Jan 2017
Published (P): 31 Jan 2017

INTRODUCTION

Head and neck vasculature in general has a more varied anatomy. With more recent advances in the treatment of head and neck cancers including intraarterial chemotherapy involving superior thyroid artery in particular require a more descriptive insight about the vessel. The knowledge about the varied patterns of origin of this artery enable precise intervention for surgical and radiological procedures.The superior thyroid artery usually arises from the external carotid artery just below the level of

the greater cornu of the hyoid bone. The origin lies closer to the anterior border of the sternocleidomastoid, then runs upwards and forwards for a short distance in the carotid triangle, descending along the lateral border of thyrohyoid. Further the artery arches downwards beneath the infra hyoid muscles.It ends at the apex of the lateral lobe of thyroid gland.

The artery is related medially to the inferior constrictor muscle and the external branch of the superior laryngeal nerve. The superior thyroid artery is a major source of supply to the thyroid gland and larynx apart from its supply to the adjacent muscles and overlying skin along with platysma. The glandular branches are generally four in number, the larger one supplying the anterior surface, a branch that crosses the upper border of isthmus, posterior and lateral branches. Besides the glandular branches, the superior thyroid artery gives off branches to infrahyoid,cricothyroid and sternocleidomastoid muscles, and superior laryngeal branch [1].

Ruptured pseudoaneurysm of the superior thyroid artery following radiotherapy of hypopharyngeal cancer can be successfully treated by embolisation therapy which requires detailed knowledge of the course and mode of origin of the vessel [2]. Arterial autograft reconstruction of the internal carotid artery after endarterectomy can be done using the superior thyroid artery [3]. An aneurysm of superior thyroid artery can present as an anterior neck mass [4]. The superior thyroid artery is the most commonly divided vessel in cases of suicidal wounds of neck, cephalic to the thyroid cartilage [5]. The important clinical implication involves the usage of superior thyroid artery as a donor vessel in the treatment of extracranial and intracranial vascular insufficiency [6]. The present study aims at evaluating the variations in the source and mode of origin and length of the artery in cadavers.

MATERIALS AND METHODS

The present study was conducted at the Institute of Anatomy,Madras Medical College. Twenty five adult embalmed human cadavers which included 18 male and 7 female cadavers were selected.The adult cadaver was placed in the supine position and a linear midline incision extending from symphysis menti to the jugular notch was made. Another incision is drawn from the symphysis menti to the angle of mandible and from the latter to mastoid process on both sides. The skin, platysma and deep fascia in the anterior triangle of neck were reflected and the infrahyoid muscles were exposed. The anterior border of sternocleidomastoid was retracted and the fat and fascia from the area between the posterior belly of digastric and the superior belly of omohyoid to expose the carotid triangle. The carotid sheath was opened and the common, internal and external carotid arteries were identified.

The following features were looked for in relation to superior thyroid artery.

1. Source of origin.
2. Mode of origin.
3. Level of origin.
4. Length of the vessel from its origin.

The level of origin of the superior thyroid artery with respect to the greater cornu of hyoid bone and carotid bifurcation was measured by digital calliper.The length of the superior thyroid artery from its origin to its termination into glandular branches was measured.

Sung Yoon Won proposed three types of source of origin of superior thyroid artery with reference to common carotid bifurcation. [7]

Type-1 STA arose from the ECA 4.5+2.3 mm above CB

TYPE-2 STA arose from carotid bifurcation

TYPE-3 STA arose from the CCA 9+ 6.4mm below the bifurcation.

RESULTS

Source of origin of the superior thyroid artery: (Table - 1) The source of superior thyroid artery was found to be external carotid artery in 52% of cadavers . In 44% the artery arose from the common carotid artery bifurcation. In 4% , the origin of superior thyroid artery was from common carotid artery below its bifurcation.

Table 1: Source of origin of superior thyroid artery.

S NO	STUDY	TYPE I	TYPE II	TYPE III
1	Sung Yoon Won	20%	40%	40%
2	Present study	52%	44%	4%

Fig. 1: Origin of superior thyroid artery from external carotid artery.

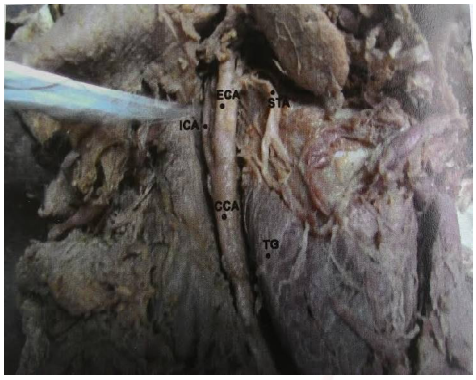


Fig. 2: Origin of superior thyroid artery at the bifurcation of common carotid artery.

Fig. 3: Origin of superior thyroid artery from common carotid arte.

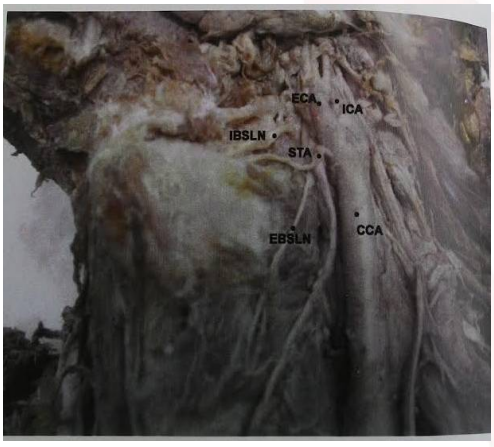


Fig. 4: Origin of superior thyroid artery as a common thyrolingual trunk.

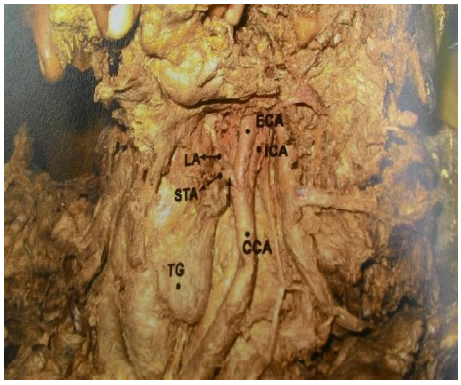
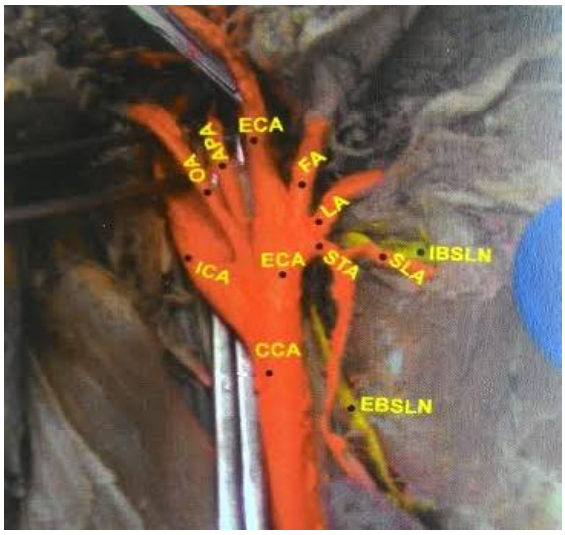
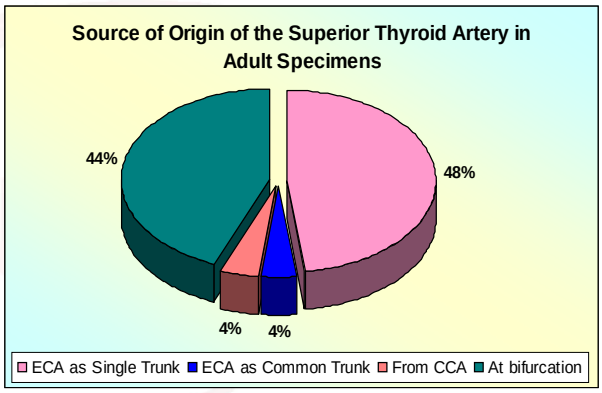


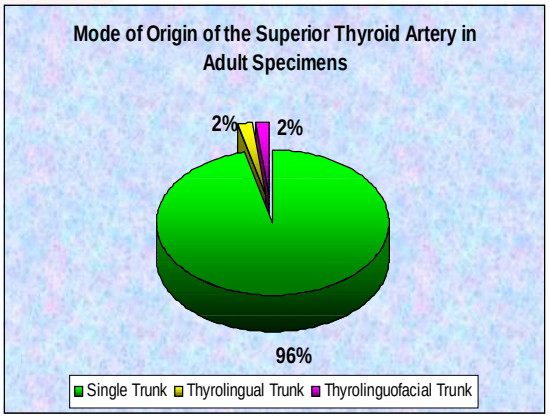
Fig. 5: Common thyrolinguofacial trunk.



Graph 1: Source of Origin of Superior Thyroid Artery in Adult Specimens.



Graph 2: Mode of Origin of the superior thyroid artery in adult specimens.



The mode of origin of the artery had varied patterns either as a single trunk or in combination with lingual, facial or both.

The superior thyroid artery arose from the anterior surface of the external carotid artery as a trunk (Fig -1). In 22 (44%) adult specimen, the superior thyroid artery arises at the bifurcation of the common carotid artery at the level of origin of external carotid artery (Fig-2). In 2 (4%) adult specimens, the STA as a single trunk arises

from the common carotid artery below its bifurcation. (Graph-2).In one (2%) specimen, the STA arises in common with lingual artery and in one (2%) STA arises in common with lingual and facial arteries (Graph-3).

Level of origin of the superior thyroid artery with respect to greater cornu of hyoid bone and carotid bifurcation: The level of origin of the superior thyroid artery was measured with respect to the greater cornu of the hyoid bone and secondly with reference to the carotid bifurcation. In 94% of cases, the artery originated 1cm below the greater cornu of hyoid bone. The artery lay at and above the greater cornu of hyoid bone in 2% and 4% respectively. The distance of the level of origin from greater cornu of hyoid bone had a wide range from 0.1cm to 2.9cmthe average distance being 1.25cm.

In 52% adult specimens, the average distance of origin of the superior thyroid artery from the external carotid artery above the level of carotid bifurcation was found to be 4.7mm, range being 1 – 10 mm.In 44% adult specimens, the superior thyroid artery arose at the level of carotid bifurcation.In 4% specimens, the average distance of origin of the superior thyroid artery from the common carotid artery below the level of carotid bifurcation was found to be 13mm range being 12mm to 14mm. The average length of the superior thyroid artery from its origin to the termination into glandular branches measured 3.2 cmon the right side and 3.4 cm on the left side. It ranged from 1.2-6.5cm.

DISCUSSION

The results of the present study was compared with those of the previous authors.

Table 2: Comparison of the source of origin of superior thyroid artery.

S NO	STUDY	SOURCE OF ORIGIN		
		ECA	CCA AT BIFURCATION	CCA BELOW BIFURCATION
1	Remmert .S. et al 2004 [8]	47%	23%	30%
2	Daseler and Anson 1959 [9]	45%	-	-
3	Smith et al 1978 [11]	-	-	15%
4	Present study	52%	44%	4%

The present study coincided with the study of Remmert S et al [8] and Daseler and Anson [9] study in the percentage of origin of superior thyroid arteryfrom external carotid artery being around 50%. The superior thyroid artery arose from the common carotid artery in 4% of specimens, which is much lower compared to the results of Daseler and Anson and Remmert S.et al study .The superior thyroid artery was found to arise from the bifurcation of the common carotid artery in 44% of adult specimens which was found to be higher when compared to Remmert.S. et al study.

Henry N. Gray (1858), Lambert Rogers (1930) stated that the superior thyroid artery may share a common origin with the lingual artery and may also arise in common with lingual and facial artery [1,10].

The present study also witnessed similar patterns with regard to the mode of origin in 2% of cases representing each pattern separately.

The level of origin of the superior thyroid artery arises was found to be below the greater horn of the hyoid bonein a majority of specimens(94%) in the present study. In the present study the mean distance of origin of the STA below the level of greater cornu of hyoid bone was 1.25cm.

In the present study**,** in 52% specimens, the superior thyroid artery arose from the external carotid artery at a mean distance of 4.7 mm above the carotid bifurcation. The origin of the STA from the external carotid artery above the carotid bifurcation was reported by many authors but the exact measurement was not given by any of the authors.Stephen D.Smith and Robert S.Benton (1978) reported that the STA arises from the common carotid artery 27mm proximal to the bifurcation of the common carotid artery [11]. Issing. P.R. et al (1994) stated that the STA arose from arteria carotis communis 35mm below the bifurcation of the common carotid artery[12]. Marques.S.R. (2002) reported that the STA branches from the common carotid artery 3mm below the carotid bifurcation in one case and 0.8mm in another [13].

In the present study, the STA arises from the common carotid artery below the carotid bifurcation at a distance of 12 mm in one case and 14mm in another case, which is lower than Stephen D.Smith & Robert S.Benton and Issing P.R. et al and much higher than Marques.S.R. study.

CONCLUSION

The superior thyroid artery being a highly variant artery with respect to ethnic background showed much differences to the previous studies. Superior thyroid artery cannulation is being done during carotid artery operation for monitoring mean pressure and to draw blood samples for gas analysis [14]. The most important cause of laryngeal oedema in post operative period of thyroidectomy is tension haematoma deep to the cervical fascia which is usually due to slipping of a ligature of the superior thyroid artery [15]. The source of origin of superior thyroid artery had type I (Sung Yoon Won) dominance in this subpopulation of cadavers. The authors aimed at measuring the distance of the origin of the superior thyroid artery from the greater cornu of hyoid bone and found the mean distance to be 1.25cm. In addition, the length of the superior thyroid artery from its origin to termination ranged between 1.2-6.5cm. Its wide utility in head and neck surgeries and neo adjuvant chemotherapy prompted the authors to study about the superior thyroid artery in this subsect of population.

Conflicts of Interests: None

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How to cite this article:

V.Rajapriya, T.Preethi Ramya, T.S.R.Anjana. AN ANATOMICAL STUDY ON THE ORIGIN AND LENGTH OF THE SUPERIOR THYROID ARTERY IN ADULT HUMAN CADAVERS WITH ITS CLINICAL SIGNIFICANCE. Int J Anat Res 2017;5(1):3421-3425. **DOI:** 10.16965/ijar.2016.493