Section: Anatomy

Original Research Article

VARIATIONS IN THE ORIGIN OF SUPERIOR THYROID ARTERY- A CADAVERIC STUDY IN THE SOUTH INDIAN POPULATION

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Received : 10/05/2024
Received in revised form : 14/07/2024
Accepted : 29/07/2024

Keywords:
Superior Thyroid Artery, Thyroid gland, Common Carotid Artery, External Carotid Artery, Carotid bifurcation.

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DOI: 10.47009/jamp.2024.6.4.103

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (4); 526-529

Abstract

Background: Thyroid surgery is one of the major surgeries and quite often performed, a thorough knowledge of variations in the arterial supply to thyroid gland is very essential for surgeons to prevent alarming number of table deaths in patients with thyroid disease due to excessive and uncontrollable bleeding. The variations in the origin and branching pattern of superior thyroid artery (STA) is important for surgical procedures in the neck region, such as radical neck dissection, catheterization, reconstruction of aneurysm, carotid endarterectomy and intervention radiology. **Aim:** To study the origin of Superior thyroid artery in south Indian cadavers. **Materials and Methods:** 50 sides of the neck from the 25 formalin embalmbed cadavers on both sides (25 right and 25 left) were studied. Dissection and observational method employed for this study. The infrahyoid group of muscles were identified and reflected. The sternocleidomastoid muscle and superior belly of omohyoid were displaced laterally. After reflecting the sternohyoid, sternothyroid muscles the thyroid gland was exposed. The fascia was removed from the lobes of the thyroid gland exposing its arteries and veins and studied the origin of STA. **Results**: The superior thyroid artery arose from the external carotid artery (ECA) in 70% of cases, from the common carotid artery (CCA) bifurcation level in 24% of cases and in 6% from the common carotid artery. **Conclusion:** From the present study it was concluded that the knowledge of variations of the superior thyroid artery origin can be used during thyroidectomy surgery and other surgical procedures in the head and neck region, where the ligation of all the thyroid vessels is highly essential to ensure proper homeostasis.

INTRODUCTION

The vascular pattern of the human body especially the arterial systems, is one of the systems that show number of variations. A variation in the course, branching pattern and relation with the adjacent structures of an artery is both interesting and significant for anatomists, surgeons and radiologists. Thyroid gland is a butterfly shaped red brown coloured, highly vascular gland situated in the midline of the neck. Blood supply to the thyroid gland shows three to four times higher when compared to that of brain1 and is six times more than the kidney.[2] Each thyroid lobe is supplied by a pair of superior and inferior thyroid arteries and drained by pair of three veins.

The artery which mainly supplies the thyroid gland is the Superior Thyroid Artery (STA) and is closely related to the external branch of the superior laryngeal nerve. Hence identification of the artery intra-operatively becomes very important. Without anatomical knowledge of the Superior thyroid artery, it almost becomes impossible to carry out surgeries of the thyroid gland without complications.[3]

The superior thyroid artery normally originated from the external carotid artery, but previous studies have documented the variant origin of the superior thyroid artery from the other arteries also. The findings regarding the superior thyroid artery origin is important because, in case of any occlusion of carotid arteries, the STA artery becomes a possible route of collateral circulation through the supra-

ISSN (O): 2687-5365; ISSN (P): 2753-6556

isthmic anastomosis that can support considerable blood circulation to the brain.[4]

MATERIALS AND METHODS

Source

From 50 sides of the neck from 25 embalmed cadavers (25 right and 25 left) of routine dissection during the period of July 2012 January 2015 in the Department of Anatomy, Madurai Medical College, Madurai, India.

Inclusion and Exclusion criteria

The cadavers belonging to different age groups and both the sexes were included in the study. The specimens in which the embalming has been done through the common carotid artery were omitted from this study. Any injuries in the region of neck which have injured the external carotid artery were also excluded from this study. The aneurysms, atheromatous and occlusive disease specimens were omitted

Methodology

Observation after dissection method

The superior thyroid artery and its branches were studied by gross dissection method, which involves exposure of the artery in the carotid triangle of the neck, opening of the carotid sheath, tracing its origin from the external carotid artery and its branches were studied in detail. The infrahyoid group of muscles were identified and reflected. The sternocleido-mastoid muscle and superior belly of omohyoid were displaced laterally. After reflecting the sternohyoid, sternothyroid muscles the thyroid gland was exposed. The fascia was removed from the lobes of the thyroid gland exposing its arteries and veins and studied the origin of STA.

RESULTS

Origin of Superior Thyroid Artery

In the present study, the origin of superior thyroid artery was to be normal in 35 specimens, in 12 specimens it was seen to arise from common carotid artery where it divides and in 3 specimens it was from the common carotid artery.

Figure 1: Origin of STA from External Carotid Artery

Table 1: Shows the origin of superior thyroid artery

Site of origin of superior thyroid artery			
Side of the neck	**From the ECA**	**From the level of bifurcation of the CCA**	**From the CCA**
Right side	16	8	1
Left side	19	4	2
Total (50)	35	12	3
Percentage	70%	24%	6%

DISCUSSION

"Variability is the law of life" - Sir William Osler.

As the above saying states that variations do occur in the making of human; the aim of anatomical studies usually lie in identifying, documenting, correlating with developmental reasons and clinical impacts of those variations, which still remain a challenge. Although investigations of variations in the anatomical structures have fallen in to something of an eclipse in recent years, it would seem apparent that the establishment of the limits of variations is of considerable importance in making clear surgical approaches to a given area and in warning prospective and practicing physicians to possible sources of trouble.

The Superior Thyroid Artery is the chief source of arterial blood supply to the thyroid gland and it also gives branch, to supply the larynx and structures in the neck region. The superior thyroid artery originated as a branch of the external carotid artery, arises from its front surface as a first branch, just below the greater cornu of the hyoid bone or just above the superior border of thyroid cartilage. It descends along the lateral border of thyrohyoid muscle to reach the apex of the lateral lobe of the thyroid gland. The inferior constrictor muscle and the external branch of superior laryngeal nerve are lying medial to the artery. The external laryngeal nerve is often posteromedial, and therefore at risk when the artery is being ligatured. Sometimes STA may arise directly from the common carotid artery or it may also arise from the bifurcation level of common carotid artery.

Origin of superior thyroid artery

Table no 1 explains the origin of superior thyroid artery as following –

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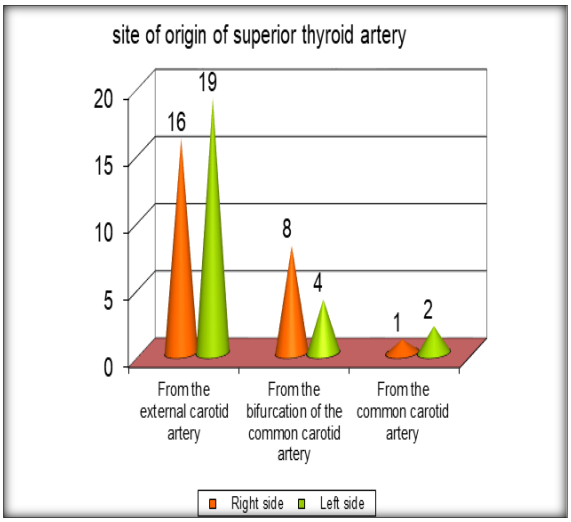
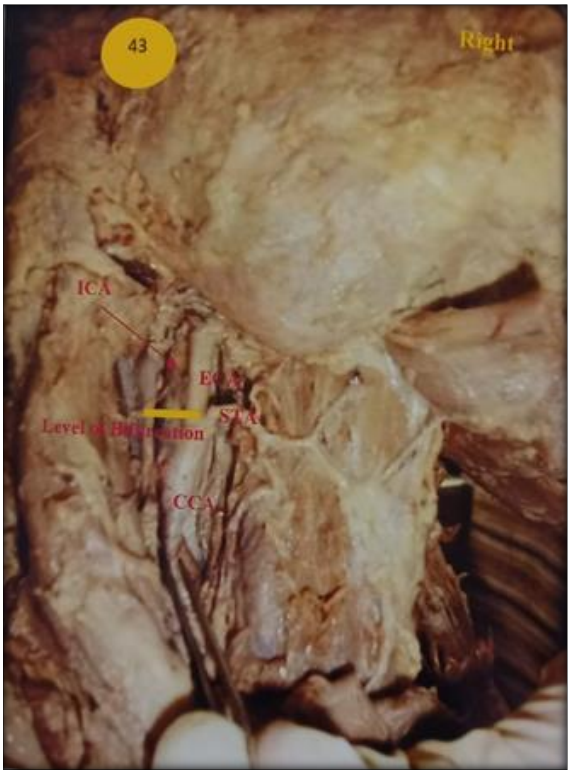
In the present study the superior thyroid artery origin was observed as following. In 70% of specimens the STA originated as a branch of external carotid artery and the common carotid artery bifurcation level gave the superior thyroid artery in 24% of samples and in 6% of cases it was from the common carotid artery.



A study conducted in 57 post-mortem cadavers in Bangladeshi people,[5] reported that the STA most commonly arose as a branch of the external carotid artery. The same study stated that, the superior thyroid artery also arises, from the common carotid artery bifurcation level which was the second most common site and followed by common carotid artery, these findings almost correlate with the present study. The present study observed that in 70% of cases the STA originated from the external carotid artery, in 24% of cases bifurcation level of common carotid artery gave the superior thyroid artery and in 6% of cases the artery arose from the common carotid artery.

Faller and Sharrer (1947),[6] reported the variable origin of STA that, it may originated from the ECA in 36% of samples and the level of bifurcation of CCA in 36% of cases and in 18% of cases the superior thyroid artery was seen to arise from the common carotid artery. In the present study the Superior thyroid artery commonly arose from the external carotid artery in 35 specimens (70%) and in 12 specimens (24%) it was from the bifurcation of common carotid artery and in 3 specimens (3%) the STA took its origin as a branch of the common carotid artery.



Picture 2: Origin of STA from the Level of Bifurcation of CCA

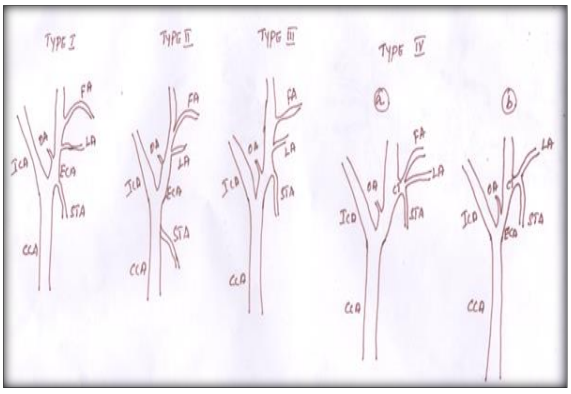
Another study conducted (2009),[7] in 330 neck specimens. In that study, they examined mainly the origin of superior tyroid artery and its branches. Among its branches, an abnormal origin of superior laryngeal artery was recorded. In this study, four different types of origins of superior thyroid artery were reported,

Type I: The STA originated from the level of CCA bifurcation.

Type II: The STA originated from the CCA.

Type III: The STA originated from the ECA.

Type IV: The STA arises as, a) Thyrol-linguo-facial trunk, b) Thyrol-lingual trunks



From the above study most common type of origin was, from the carotid bifurcation level in 49% of samples (type I).

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Picture 3: Origin of STA from Common Carotid Artery

Chandralekha and Cooper (1977),[8] studied the patterns of origins of superior thyroid artery in 40 south Indian cadavers and it was observed that in 30% of cases the superior thyroid artery originated as a branch of the common carotid artery, but this finding is not correlates with the present study. The present study revealed the origin of superior thyroid artery, from the common carotid artery only in 8% of cases.

Chandrakala and colleagues (1977),[9] concluded in their studies, that the superior thyroid artery originated either from the common carotid artery in 9% of cases or from close to the bifurcation of common carotid artery in 18.2% of cases, this finding not coincides with the present study.

Lo et al (2006),[10] studied the superior thyroid artery origin and they found that, in 52.3% of case the superior thyroid artery originated as a branch of CCA, in 46.2% it arose as a branch of the external carotid artery and in 1.5% it was from level of carotid artery bifurcation

Rohini Pakhiddey and her collegues (2013),[11] presented a case report in which they reported that, variant origin of superior thyroid artery on left side of the neck and it was arose as a branch of the common carotid artery. The present study showed the origin of superior thyroid artery from the common carotid artery in 6% of cases.

Limitation(s)

The study was done on the human cadavers. It can be extended to intra-operative and radiological studies to obtain further results and conclusions. Sample size is also a limitation for the present study

CONCLUSION

In case of thyroidectomy, ligation of all the thyroid arteries is very essential to ensure proper haemostasis. Knowledge of the anatomy of the superior thyroid artery is very important to maintain a blood free surgical field during major radical neck dissection surgeries to minimize postoperative complications.

Thus the study of superior thyroid artery is very useful in

- Performing thyroidectomy
- During carotid artery catheterization
- During head and neck surgeries
- ENT surgeries

and it also essential to the radiologists and interventional radiologist for proper identification and therapy.

In a scenario of uncontrolled bleeding during thyroidectomy, the STA arose as a branch from the CCA instead of external carotid artery; ligation of external carotid artery does not control the bleeding. In this case ligation of common carotid artery is hazardous as it supplies the brain through the internal carotid artery. At the same time, in some cases the external carotid artery gave rare variant of double superior thyroid artery, in such situations ligating of one STA not completely control the bleeding. Hence, the operating surgeon should have a clear knowledge regarding the origin, branching pattern and its variations of the superior thyroid artery, before going to any surgery in neck region.

REFERENCES

1. Mayo C H, Pummer H. The thyroid gland. St.Louis, C.V. Mosby Co; 1926.
2. Tschuewsky. Der Blustrom in der schilddruse. Pfluger's Arch. 1903,280.
3. Lee Mc Gregor's, Synopsis of Surgical Anatomy, 12 Th editions 1986
4. Macchi M., Catini C. (1995) Clinical importance of supra-isthmic anastomosis between superior thyroid arteries in six cases of occlusion of the common carotid artery. Surg. Radiol. Anat, 17: 65-69
5. Kanta Roy Rimi, Shamim Ara, Motahar Hossain, Shefyetullah KM, Humaira Naushaba, Bose BK, Postmortem Study of thyroid arteries in Bangladeshi people. 2009; vol 7 No 1, pp 26-33.
6. Faller A and Sharrer O. Uber die Variabilitat des arteria thyroidea. Acta Anat. 1947; 4: pp 117-119.
7. Varquez T, Cobiella R, Maranillo E, Valderrama FJ, McHanwell S. Anatomic variations of the superior thyroid and superior laryngeal arteries. Head neck 2009; 31: 1078-85.
8. Chandrakala G, Cooper MM. Origin of STA, Journal of Anatomical Society of India, 1977; 26:35
9. Chandrakala S P, Swapnali Maishettar G F, Variations in the origin and branching pattern of superior thyroid artery, Anatomica Karnataka, 2011; vol-5(3), page 20-24.
10. Lo A, Oehley M, Bartlett A, Adams D, Blyth P, Al-Ali S (2006) Anatomical variations of the common carotid artery bifurcation. ANZ J Surg, 76: 970–972.
11. Rohini Pakhiddey, Praina Paramita Samanta, varieant origin of Left Superior Thyroid Artery from Left Common Carotid: A Case Report, International Journal of Anatomical Variations, 2013; 6: 143-144.

ISSN (O): 2687-5365; ISSN (P): 2753-6556