ORIGINAL ARTICLE

ANATOMICAL VARIATION IN THE ORIGIN OF SUPERIOR THYROID ARTERY AND IT'S RELATION WITH EXTERNAL LARYNGEAL NERVE

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ABSTRACT

Background & aim: To identify the variations in site of origin and level of the origin of the superior thyroid artery and its relation with external laryngeal nerve.

Material & Method: A study was undertaken on 33 donated cadavers and through dissection was performed in neck region and both sides of superior thyroid artery were considered.

Results: in present study superior thyroid artery arise from external carotid artery in 66.67% cases, from carotid bifurcation in 31.81% cases and from common carotid artery in 1.51% cases. While in 86.36 % cases level of the origin was above the thyroid cartilage and in 13.64% cases level of the origin was at the same level of thyroid cartilage. The external laryngeal nerve crossed the superior thyroid artery within 1cm above the upper pole of the thyroid gland in 27.27% of cases and more than 1 cm in 72.73% of cases.

Conclusion: The information will be useful as reference for surgical procedures such as - total bilateral lobectomy, total unilateral with partial contralateral lobectomy and partial or subtotal lobectomy & others like catheterization, reconstruction of aneurysm, carotid endarterectomy and intervention radiology which is helpful to prevent complications such as bleeding or damage to laryngeal nerves.

Key words: Superior thyroid artery, External laryngeal nerve, thyroid gland, thyroid surgery, variation.

INTRODUCTION

Thyroid gland is the largest endocrine gland and plays an important role in the maintenance of the basal metabolic rate of the body and is highly vascular endocrine gland.

The superior thyroid artery normally takes its origins from the external carotid artery. Past studies have reported the incidence of origin of the superior thyroid artery from the common carotid artery in 5-45% cases[1].

Identification of arterial variation related to the thyroid gland is of immense importance in formulating planned surgical approaches to the thyroid gland in alerting the surgeons to avert inadvertent injuries to the vital anatomical structures in this area. Additionally, a detailed knowledge of these explicit arterial variations is extremely helpful while carrying out procedures like carotid angiographies, neck dissections and thyroid resections[2]. The implications of arterial variations of thyroid gland may be important for academic and clinical purposes.

This study was undertaken in an attempt to know the relative frequency of variations in arterial pattern and to compare with similar work done by others.

OBJECTIVES

The aim of the present study was to assess the anatomical variation in the origin of superior thyroid artery and its relation with external laryngeal nerve

MATERIAL & METHODS:

This study was conducted on 33 cadavers of known age and sex in the dissection laboratory, department of anatomy, Medical College, Baroda. The cadavers were embalmed through carotid arterial perfusion or femoral arterial perfusion

Dissection Method: "According to Cunningham's Manual of Practical Anatomy, Fifteenth edition". The study involved 33 cadavers, in which arterial pattern of thyroid gland was observed bilaterally. The body was in supine position with neck slightly extended.

A skin incision made from chin to sternum in midline, and the flap of skin reflected inferolaterally and platysma reflected upward. The fat and fascia removed from the margins of the sternocleidomastoid. Now the sternocleidomastoid retracted and the deep fascia removed from the anterior belly of diagastric to expose the infrahyoid muscles. Fat and fascia removed from the area

between the posterior belly of diagastric and the superior belly of omohyoid to expose the carotid triangle. This exposed common carotid and internal carotid arteries medial to it and the external carotid artery anteromedial to the internal carotid artery. Exposed the External carotid artery and its branches. The Superior thyroid artery was the lowest branch in the triangle.

The data collected during dissection on both sides includes the site of origin of superior thyroid artery (From External carotid artery/Common carotid artery/Common carotid artery bifurcation); the level of the origin of the superior thyroid artery in relation to upper border of lamina of thyroid cartilage (Above the lamina/at the lamina /below the lamina); and Relation of External superior laryngeal nerve to the superior thyroid Artery i.e. Distance from upper pole of the thyroid gland to the level. External superior laryngeal nerve turns medially from Superior thyroid artery was measured using digital vernier caliper.

RESULT

The site of the origin of the superior thyroid artery (STA) was evaluated as it arose from external carotid artery in 66.67% cases, from carotid bifurcation in 31.81% cases and from common carotid artery in 1.51% cases. (Photographs-1,2,3)

Table-1: Site of the origin of the superior thyroid artery (STA)

Site of origin of sta	Right side (n=33) (%)	Left side (n=33) (%)	Total (n=66) (%)
External Carotid Artery	20 (60.61)	24 (72.73)	44 (66.67)
Common Carotid Bifurcation	12 (36.36)	09 (27.27)	21 (31.81)
Common Carotid Artery	01 (3.03)	-	01 (01.51)

Table-2: Level of the origin of the superior thyroid artery in relation to upper border of thyroid cartilage

Level of the origin	Right side (n=33) (%)	Left side (n=33) (%)	Total (n=66) (%)
Above the upper border of cartilage	29 (87.88)	28 (84.85)	57 (86.36)
At the upper border of cartilage	04 (12.12)	05 (15.15)	09 (13.64)
Below the upper border of cartilage	-	-	-

Table-3: Distance from upper pole of the thyroid gland to the level where external laryngeal nerve turn medially from STA

Distance	Right side (n=33) (%)	Left side (n=33) (%)	Total (n=66) ((%)
More than 1 cm	25 (75.76)	23 (69.70)	48 (72.730
Less than 1 cm	08 (24.24)	10 (30.30)	18 (27.27)

Regarding the level of the origin of the superior thyroid artery in relation to upper border of thyroid cartilage, in 86.36 % cases level of the origin was above the thyroid cartilage and in 13.64% cases level of the origin was at the same level of thyroid cartilage. (Photographs-5,6)

Regarding the evaluation of distance from upper pole of the thyroid gland to the level where External superior laryngeal nerve turns medially from Superior thyroid artery was found More than 1 cm in 72.73% cases & Less than 1 cm in 27.27% cases. (Photograph-4)

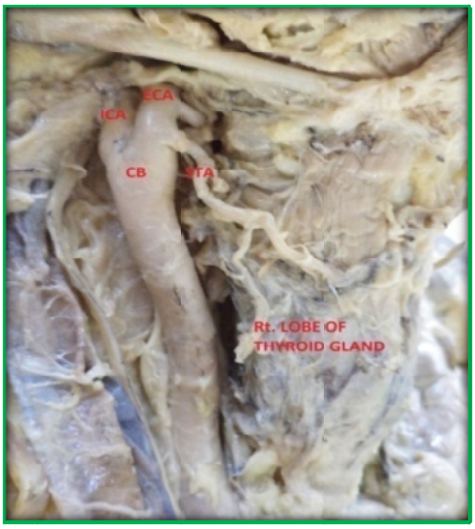
DISCUSSION

The Superior thyroid artery commonly arises from the External carotid artery just above the carotid bifurcation. It may also arise from the Common carotid artery or from the bifurcation of Common carotid artery. Less frequently the STA arises from subclavian artery (SCA) or as a common trunk with the lingual and facial branches of ECA. Rarely The Superior thyroid artery may absent[9,10,11]. In present study, the superior thyroid artery arise from external carotid artery in 66.67% cases, from carotid bifurcation in 31.81% cases and from common carotid artery in 1.51% cases.(Photographs-1,2,3)

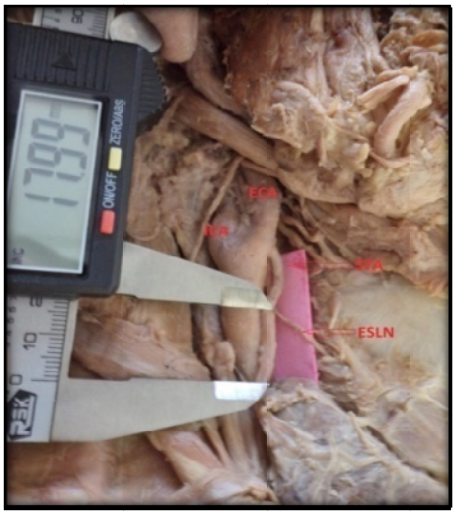
Table- 4 shows comparison of site of origin of STA in various studies

Site & Prevalence	Quoting author
External Carotid Artery	
59%	Takkallapalli Anitha et al [3]
30%	Lucev [4]
68%	Banna M. et al [5]
66.67%	Present study
Common Carotid Artery	
21%	Takkallapalli Anitha et al [3]
47.50%	Lucev [4]
10%	Banna M. et al [5]
1.51%	Present study
Carotid Bifurcation	
19%	Takkallapalli Anitha et al [3]
22.50%	Lucev [4]
22%	Banna M. et al [5]
31.81%	Present study

The level of the origin of the superior thyroid artery in relation to upper border of thyroid cartilage is important and it has been reported in previous studies. A study conducted by Takkallapalli Anitha et al [3] found that the STA arises below the level of upper border of thyroid cartilage (56% on right, 66% on left side).

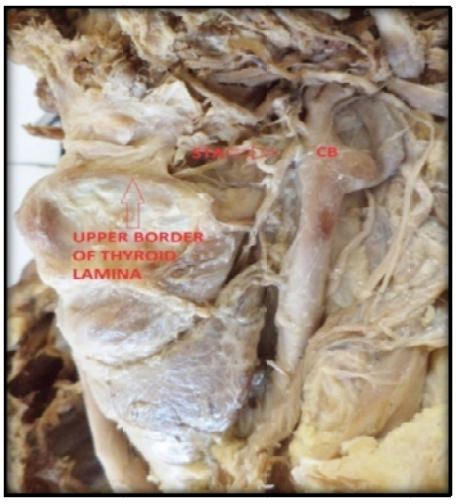


Photograph-1: Origin Of Superior Thyroid Artery From External Carotid Artery



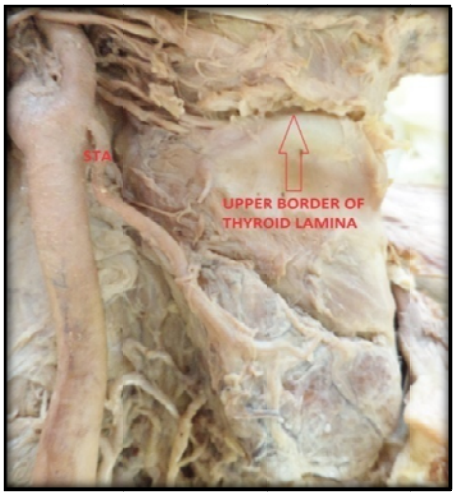
Photograph-4: Distance From Upper Pole of The Thyroid Gland To The Level Where Esln Turn Medially From Sta

Photograph 2: Origin Of Superior Thyroid Artery From Carotid Bifurcation And Superior Laryngeal Artery Arising From External Carotid Artery



Photograph-5: Origin Of The Superior Thyroid Artery Above The Upper Border Of Lamina Of The Thyroid Cartilage

Photograph-3: Origin of Superior Thyroid Artery From Common Carotid Artery



Photograph-6: Origin Of The Superior Thyroid Artery Above The Upper Border Of Lamina Of The Thyroid Cartilage

The STA originates at the level of upper border of thyroid cartilage (30% right, 16% left) and above the level of upper border of thyroid cartilage (14% right, 18% left). In present study, level of the origin was above the thyroid cartilage in 87.88% on right and 84.85% on left side and in 13.64% cases level of the origin was at the same level of thyroid cartilage. (Photographs-5,6)

The external laryngeal nerve runs parallel to superior thyroid artery and later turns medially from the artery either above or below the upper pole of the thyroid gland. The distance between upper pole of thyroid gland and medial turning of external laryngeal nerve has been reported in previous studies[6,7,8]. A study conducted by Magoma et al [6] found that the external laryngeal nerve crossed the superior thyroid artery within 1cm above the upper pole of the thyroid gland in 25% of cases and more than 1 cm in 75% of cases. In present study the external laryngeal nerve crossed the superior thyroid artery within 1cm above the upper pole of the thyroid gland in 27.27% of cases and more than 1 cm in 72.73% of cases. (Photograph-4)

CONCLUSION

A profound knowledge of the anatomic characteristics and variation of the superior thyroid artery such as its origin, course and branching patterns is an important value for a safe attempt in suitable position for catheterization and approach for surgeons in planning and performing procedure in neck region. During radical neck surgery, the most feared complication is the rupture of the superior thyroid artery and its branches. Iatrogenic injury can be avoided with this knowledge as well as possible anatomic and pathological variation that may exist.

The awareness of anatomic variation of the origin of superior thyroid artery may also warn the surgeons that during thyroid surgery, external carotid artery ligation in uncontrollable bleeding will not always be sufficient to stop bleeding.

The knowledge of relationship of superior thyroid artery to external superior laryngeal nerve is very important for surgeons during thyroid surgeries to avoid injuries to above nerves while ligating STA

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