

## STUDY ON VARIATIONS IN ORIGIN OF SUPERIOR THYROID ARTERY

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### ABSTRACT

#### INTRODUCTION

Superior thyroid artery is the chief artery which supplies blood to the thyroid gland, upper part of larynx and the neck region. A thorough knowledge of variations in the origin of superior thyroid artery is very much essential for surgeons to prevent alarming number of table deaths in patients with thyroid disease due to excessive and uncontrollable bleeding. It also helps the physicians for proper physical examination and treatment of the patient. It is of help to anatomists for learning the variant patterns. Aim of the study is to note in detail the variations in origin of superior thyroid artery.

#### KEYWORDS

Thyroid gland, Upper part of larynx, Thyroid disease, Common carotid artery, External carotid artery, Carotid bifurcation.

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**INTRODUCTION:** Thyroid gland is the largest and highly vascular endocrine gland which envelopes the anterior and lateral aspects of pharynx, larynx, oesophagus and trachea like a shield.

It has been calculated that in a single minute, for each hundred grams of gland substance, about 560ml of blood circulates through the gland and is five and half times more vascular than the kidney. Apart from its significant endocrinal functions it maintains basal metabolic rate and it is also susceptible to many diseases in human beings like thyrotoxicosis, hypothyroidism, cretinism, benign malignant tumours, goitre and infertility.<sup>1</sup>

The major blood supply to the thyroid gland comes from two pairs of vessels the left and right superior thyroid artery arising from the external carotid artery and left and right inferior thyroid artery arising from the subclavian artery.

Superior thyroid artery further divides into an anterior and a posterior and a lateral branch while the inferior thyroid artery divides into a medial branch and a lateral branch.

Thyroid gland develops from the thyroglossal duct dorsal to the tuberculum impar. It grows caudalwards in the median plane central to the hyoid bone. When the duct reaches ventral to the proximal part of the trachea it divides into bilobed mass which forms the primordium of the isthmus and the lateral lobes of the thyroid gland. Subsequently the thyroglossal duct disappears leaving a trace of its cephalic attachment as the foramen caecum of the tongue; sometimes the caudal end of the duct persists as the pyramidal lobe which is attached to the isthmus of the thyroid gland.<sup>2</sup>

Superior thyroid artery is the first branch of external carotid artery. Associated with regression of first and second aortic arches a new vessel external carotid artery sprouts headwards from the aortic sac close to the origin of the third aortic arch and extends along the ventral wall of the pharynx to establish secondary connection with the united origin of the maxillary and mandibular branches of stapedial artery and later incorporated with third aortic arch; and extends along the ventral wall of the pharynx to establish secondary connection with the united origin of the maxillary and mandibular branches of the stapedial artery and later incorporated with third aortic arch.

**AIMS AND OBJECTIVES:** Thyroid arteries must be ligated carefully, as the superior thyroid artery tends to retract and fill the field with blood. The superior thyroid artery should not be clamped above the upper pole of the thyroid because the external laryngeal nerve may be injured. If the artery is clamped at the pole, a branch may escape, with resulting haemorrhage. The entire superior pole together with the artery, should be clamped and ligated.<sup>3</sup>

The external branch of the superior laryngeal nerve is intimately associated with superior thyroid artery in relation to the superior pole of the thyroid gland rendering it vulnerable to injury during the ligation of this vessel during thyroidectomy.<sup>4</sup>

A number of variations have been reported in the origin and branching pattern of superior thyroid artery.<sup>5</sup>

Thus a study on the superior thyroid artery supplying thyroid gland was taken up to know the variations in its origin.

**MATERIAL AND METHODS:** Study was conducted on 50 samples in Department of Anatomy, Bangalore Medical College and Research Institute.

The dissection procedures were followed as given in the Cunningham's Manual of Practical Anatomy Volume III-Head and Neck and Brain, 15<sup>th</sup> edition.

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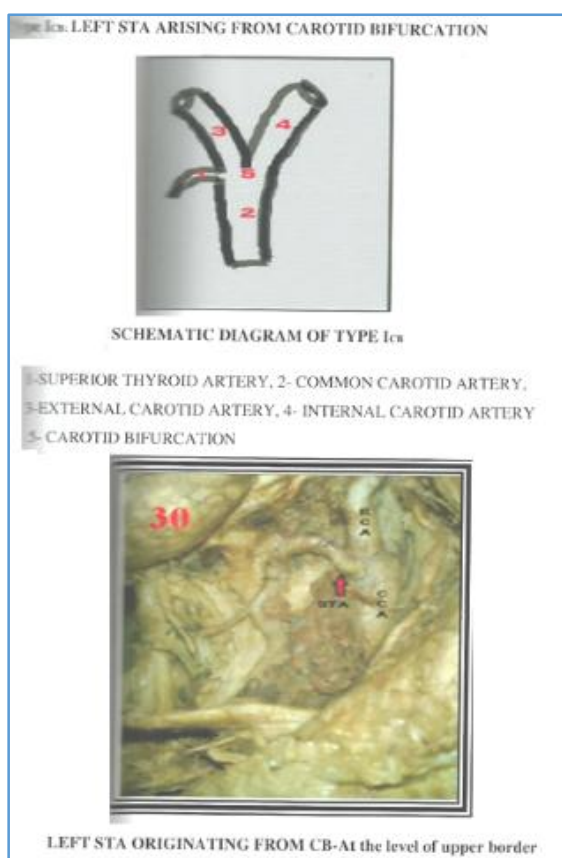
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A skin incision along the impression of the anterior border of sternocleidomastoid muscle was made from its sternal origin to the angle of mandible bilaterally. Skin and cervical fascia were reflected, sternocleidomastoid muscle was exposed and retracted. Infrahyoid muscles were sectioned and dissected away to expose the thyroid gland.

Submandibular gland, lymph nodes, connective tissue and digastric muscles removed to expose the entire common, external and internal carotid artery, as well as the carotid bifurcation. Branches of the external carotid artery were identified. Arteries which entered the superior pole of the thyroid gland was identified as superior thyroid artery and traced to note their origin and branching patterns. The specimens were duly numbered and photographed.

**RESULTS:** Present study conducted on the origin of superior thyroid artery on 50 specimens showed three types of origin-from external carotid artery in 68%, from the common carotid artery in 24% and from carotid bifurcation in 8%. (Table -1 & 3)

On the right side specimen's origin of superior thyroid artery showed variations – taking its origin from carotid bifurcation in 8% and from common carotid artery in 12%. On the left side specimen's origin of superior thyroid artery showed variations – taking its origin from carotid bifurcation in 8% and from common carotid artery in 36%. Origin of superior thyroid artery in respect to thyroid cartilage showed – origin from at the level of upper border of thyroid cartilage in 48%, from above the level of upper border of thyroid cartilage in 48%, from below the level of upper border of thyroid cartilage in 4%.



**DISCUSSION:** Takkapalli Anitha et al<sup>6</sup> describes out of 50 cadavers, variant origin of superior thyroid artery was 42% from common carotid artery, 38% from common carotid artery bifurcation and she also states the level of origin of superior thyroid artery in relation to upper border of thyroid cartilage as, at the level-46%, above the level=32%, below the level-22%.<sup>6</sup>

Ongeti and Kevinwangwe conducted study on 46 cadavers (36 males and 10 females). They undertook dissection of neck region bilaterally to expose the origin of the superior thyroid artery.<sup>2</sup> It originated from the external carotid artery, common carotid artery, carotid bifurcation and linguo facial trunk in 80%, 13%, 2.2% and 6.5% of the cadavers respectively.<sup>2</sup>

Magoma G studied fifty formalin fixed cadavers and encountered that the superior thyroid artery originated from external carotid artery and common carotid artery in 74.4% and 25.6% of cases respectively. The right side displayed a higher frequency of origin from the common carotid artery.

Sophia Anagnostopoulou studied 68 formalin embalmed adult cadavers of both sexes. Based on results they categorized the superior thyroid artery emerging pattern into three major types A, B and C according to its origin (which was common carotid artery, external carotid artery and common carotid artery bifurcation respectively). Regarding type B they found that the left superior thyroid artery arises approximately 2mm closer to the common carotid artery bifurcation compared to the right superior thyroid artery.<sup>7</sup>

Lucev et al reported that superior thyroid artery arises more often from common carotid artery in 47.5% of cases than from external carotid artery 30% of cases. In about 22.5% of cases superior thyroid artery was reported to be originating from the carotid bifurcation.<sup>8</sup>

Chandrakala S. P. and Swapnat Mavishettar G.F. studied fifty-five adult human cadavers (45 males, 10 females) aged between 25 to 50 years and 25 foetus (18 female, 7 male) aged between 24 to 34 weeks by gross dissection and observed that the superior thyroid artery arose either from the common carotid artery in 9.1% or from external carotid close to the bifurcation of common carotid artery in 18.2%. The variations in the branching pattern of the artery were also noticed. The branches to thyrohyoid membrane in 6%, levator glandular thyroidae in 6% and pyramidal lobe in 8%.<sup>9</sup>

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Konstantinos Natsis studied variability in the anatomy of superior thyroid artery on 100 carotids. Results indicated that superior thyroid artery originated at the level of carotid

bifurcation in 49 specimens (49%), from the external carotid artery in 39 (39%) and from common carotid artery in 12 (12%).<sup>10</sup> (table II).

**CONCLUSION:** Thus the study on the variations in the origin of the superior thyroid artery is important. These variations are considered important as the knowledge of the variations in the origin is to be kept in mind during interventional radiology and surgical procedures such as cricothyroidectomy, radical neck dissection, carotid aneurysm reconstruction, endarterectomy, tumour embolization, intra-arterial chemotherapy and microsurgical arterial implantation, harvesting of the sternocleidomastoid osteomuscular flaps and cardiac catheterization.

From the above observations it is evident that there is a possibility of wide range of variations in the origin of superior thyroid artery.

Thus the study on variations in origin of superior thyroid artery could help avoid serious implication during radiological examination, interventions, ultrasound examination, thyroid and parathyroid surgery, tracheostomy, surgery on larynx, pharynx and upper oesophagus.

Number of specimens 50 -25 right -25 left	Origin	Right	Left	Total	%
	Common carotid artery	3	9	12	24%
	Carotid bifurcation	2	2	4	8%
	External carotid artery	20	14	34	68%
<b>Table 1: Variation of origin of superior thyroid artery</b>					

Study conducted on origin of superior thyroid artery by konstantinos Natsis on 50 specimen shows.

External	Right	Left	Total	Percentage
carotid artery	20	14	34	68%
Carotid bifurcation	2	2	4	8%
Common carotid artery	3	9	12	24%

Level of origin in relation to upper border of thyroid cartilage	Right	Left	Total	%
At the level	12	6	18	36%
Above the level	12	17	29	48%
Below the level	1	2	3	6%
<b>Table showing the level of origin of superior thyroid artery</b>				

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