ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 10 | October - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A GROSS ANATOMICAL STUDY OF SUPERIOR THYROID ARTERY IN SOUTH INDIAN POPULATION

Anatomy

Dr Namitha Viswanath Associate Professor,department Of Anatomy ,government Medical College, Kozhikode, Kerala.

ABSTRACT

A thorough knowledge of variations of superior thyroid artery is necessary during thyroidectomy. This study emphasis on superior thyroid arteries in south Indian population.

Materials and Methods :A cadaveric study in Department of Anatomy, Government Medical College, Kozhikode where 50 thyroid glands (40 males and 10 females) were dissected carefully. Variations in Origin and number of superior thyroid artery was noted

Results :A single superior thyroid artery was observed. In 73% of cases superior thyroid artery was taking origin from External Carotid Artery(Type 111 origin) followed by Type 1 origin where it arose from Carotid bifurcation (17% of cases).In 10% of cases It took origin from Common Carotid artery(Type 11 origin)

Conclusions : This study highlights on superior thyroid arterial pattern which helps to reduce the complications during thyroidectomy

KEYWORDS

Superior Thyroid Artery,thyroidectomy, Thyroid Gland

INTRODUCTION

Variations in arteries supplying the thyroid gland is quite common. Since haemorrhage is a possible complication during thyroid surgery, a study of exact arterial pattern of thyroid gland and its variations is necessary. A thorough knowledge of variations of thyroid arteries if not well understood may lead to fatal bleeding and vascular damage. Recent advances in interventional radiology has led the physicians to make use of arterial embolisation as a possible alternative treatment for graves disease and other thyroid conditions requiring ablation of thyroid gland. A knowledge of vascular pattern of thyroid gland prior to embolisation, necessitates selective angiography before the procedure.

A detailed study of superior thyroid artery was done right from 18th century.

Richard Quain(1844) made an extensive study on the arterial system in general. He compiled his work as a book "Anatomy of the arteries of human body and its application to pathology and operative surgery" with a series of lithographic drawings on stone by Joseph Maclise.

His observations were represented in plate XX111. He noted superior thyroid artery in 292 cases. Variations found were as follows

- In 5 cases the artery supplied the thyroid body on the opposite side
- It was derived from common carotid artery in 41 cases
- The origin was joined to that of lingual artery in 2 cases
- The origin was joined to the common trunk of facial and lingual arteries in1 case.
- There were double superior thyroid arteries in 3 cases.
- The superior laryngeal artery arose separate from external carotid in 24 cases.
- The superior laryngeal artery arose from common carotid artery in 2cases.

Anderson,Demonstrator of Anatomy at Queen's college Belfast and noted certain variations. In one case he noted that superior thyroid artery was from common carotid artery near its termination. He also described a double superior thyroid artery which arose from the internal part of external carotid artery.

Lambert Rogers in 1921 did a study on the arterial supply of thyroid gland. When studying the superior thyroid artery, he noted a case where a common origin was there for superior thyroid artery and lingual artery. He also noted a case where superior laryngeal artery and sternomastoid branches arose independently from External carotid artery.

One of the most extensively illustrated monographs of superior thyroid artery was given by Adachi, Professor of Anatomy at the Universities of Okayama and Kyoto in 1928. After spending 30 years studying the arterial variations in 252 Japanese cadavers, he published his monumental works of two volumes with 539 illustrations. He put forward a classification for the origin of superior thyroid artery. He typed it into four,

Type 1- Superior Thyroid artery was found to arise at the level of carotid bifurcation.
Type 11- Superior thyroid artery was found to arise from common carotid artery.
Type 111- Superior thyroid artery from external carotid artery.
Type 1V- Superior thyroid artery as a common trunk from one or more branches of carotid arterial tree
Type 1V a- when superior thyroid artery arose with lingual artery to form a common thyrolingual trunk
Type 1V b – When superior thyroid artery arose in common with lingual and facial arteries to form thyrolinguo-facial trunk Percentage of cases reported were

STA Origin- Adachi	Percentage
Type 1	27% of cases
Type 11	13 % of cases
Type 111	59 % of cases
Type 1Vb	1% of cases

Faller and Scharrer in 1947 studied the superior thyroid artery in detail. According to them it arose from common carotid artery in 18% of cases, from the point of division of common carotid artery in 36% and from external carotid artery in 46% of cases.

Aaron and Chawaf in 1967 had undertaken studies on superior thyroid artery. They dissected 187 cadavers and recorded their observation as follows. Origin of superior thyroid artery showed type 1 in 82 cadavers, Type 11 in 14 cadavers, Type 111 in 80 cadavers and Type 1V a in 11 cadavers.

Poissel and Golth (1974) studied superior thyroid artery in 156 cadavers. Their observation about the origin of superior thyroid artery were as follows

STA origin- Poissel and Golth	Percentage
Type 1	24%
Type 11	6%
Type 111	66%
Type 1Va	3%
Type 1Vb	1%

A study regarding the diameter of superior thyroid artery was done by Czerwinski in 1981. He did dissections on 240 cadavers to note the diameter of superior thyroid artery. He noted the diameter of superior thyroid artery was the third largest in size after facial and lingual arteries.

Yamasaki in 1989 reported 4 cases (1 in adult and 3 in fetuses) of thymic artery arising from superior thyroid artery. He observed that the superior thyroid artery supplied both the thyroid gland and thymus.

Lucev in 2000 did a study on the arterial pattern of thyroid gland. His observations on the origin of superior thyroid artery are as follows

STA origin- Lucev	Percentage
Type 1	22%
Type 11	47 %

Type 111	30 %
Type 1V	1%

Terayama et al in 2007 did a study to elucidate the role of superior thyroid artery in intra-arterial infusion chemotherapy for laryngeal and hypopharyngeal cancers. In this study they noted that super selective intraarterial chemotherapy for laryngeal cancer from superior thyroid artery showed better results.

Vazquez and Cobiella of Department of Human Anatomy and Embryology, University of Madrid, Spain in 2008 did a study on 336 embalmed hemi necks. Their observations are given below

STA ORIGIN-Vazquez & Cobiella	PERCENTAGE
Type 1	49 %
Type 11	27 %
Type 111	23 %
Type 1Va	0.6%
Type 1V b	0.4%

In type 11 origin (superior thyroid artery arising from common carotid artery) the distance from the origin of superior thyroid artery to carotid bifurcation was found to vary between 0.1cm and 2.1cm. In type 111 origin ,where superior thyroid artery originated from external carotid artery, the distance from carotid bifurcation varied between 0.1cm and 1.5cm.

Ozgur and Govsain at Ataturk Medical Technology Vocational training school, Turkey in 2008 did a study on superior thyroid artery. They stated that the knowledge of variations is important for surgical procedures in neck region such as emergency cricothyroidotomy, Radical Neck dissection, reconstruction of Aneurysm and carotid endarterectomy. Origin of superior thyroid artery from carotid bifurcation was found in 40% of cases, from external carotid artery in 25% and from common carotid in 35% of cases.

Kanta and Motahar at Department of Anatomy, Dhaka Medical College in 2009 did a study on the thyroid arteries in Bangladesh people .57 cadavers were dissected during a period of one and half years. They stated that superior thyroid artery commonly originated from external carotid artery followed by, from bifurcation of common carotid artery and then from common carotid artery. Double superior thyroid artery was present in 5.3% of cases seen

In 2009, Dedecjus et al from polish mother's memorial hospital did a study to evaluate the role of selective embolisation of thyroid arteries as a treatment of toxic goiter. They stated that in the recent years, an increasing interest in the application of SETA (Selective embolisation of thyroid arteries) is seen in the treatment of toxic goiter.

The present work is a gross anatomical study on thyroid gland to note the type of origin and number of superior thyroid artery.

MATERIALS AND METHODS

This study on thyroid gland was undertaken in 50 cadavers (40 male and 10 female). 28 of them were adults and 22 fetuses. The study of the adult cadavers was undertaken in the specimens assigned for dissection of undergraduate students of Government Medical College, Kozhikode for a period of 2 years.

The fetuses for the study were obtained from Institute of Maternal and Child Health attached to Government Medical College, Kozhikode. Ethical committee approval was obtained. The fetuses were preserved in 37% commercial formalin by injecting the material into the anterior fontanelle (about 100cc), the right and left side of chest cavity (about 50cc) and peritoneal cavity (about 300cc). Multiple injections were also given into the extremities. The fetuses thus injected were kept immersed in large buckets containing formalin until they were taken out for dissection.

A midline incision, extending from symphysis menti to suprasternal notch and 2 lateral incisions extending from suprasternal notch laterally was made. Skin, platysma and investing layer of deep cervical fascia were turned laterally. For better view of thyroid gland, strap muscles were detached from the upper end and turned down. The gross anatomical features of thyroid gland were looked. Arterial supply of thyroid gland was observed. The origin and number of superior thyroid artery on each side was noted.

BIOSTATISTICS

1. QUALITATIVE DATA

The evaluated feature of thyroid gland namely the superior thyroid artery ,its origin and number, variations or other anomalies were included in the qualitative data .sex was included in each case.

2. QUANTITATIVE DATA

The quantitative features were entered in master chart and quantified according to their frequency. Tables were used to describe the frequency distribution of each parameter. Appropriate bar diagrams and pie charts were prepared for studying both the study groups (male and female).

STATISTICAL TEST

CHI SQUARE TEST

The chi square test was used to find out whether the observed series of frequency differ between both the study groups (Snedecor & Cochran 1967).The statistical significance or probability was expressed as P value. Statistical analysis was done by using SSP2 (Statistical package for social sciences) programme under the guidance of a statistician.

RESULTS

Number

In all the cases studied, a single superior thyroid artery was observed on both sides.

Origin

It was found taking origin commonly from External Carotid Artery (Type 111 origin)

Type 1 origin – It arose from Carotid bifurcation in 17% of cases (Fig1)
Type 11 origin -It took origin from Common Carotid artery in 10% of cases(Fig2)
Type 111 origin-In 73% cases, it took origin from the external carotid artery(Fig3)

As the P value is above 0.05 no significant statistical difference is seen among males and females. Different types of origin of superior thyroid artery is given in Table1, 2 and Chart 1, 2.

Chart 1

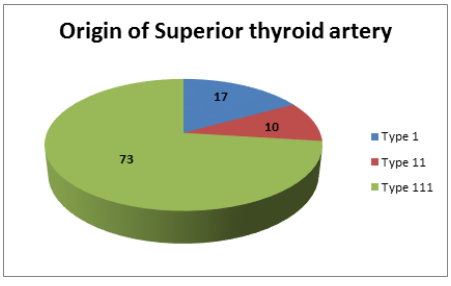
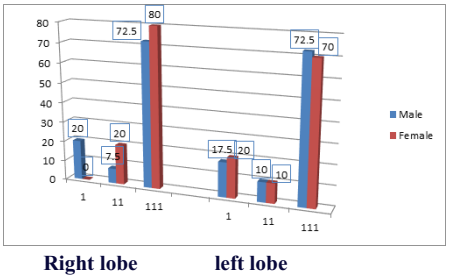


Chart 2 Types Of Origin Of Superior Thyroid Artery



Right lobe left lobe

Table 1 Types Of Origin Of Superior Thyroid Artery

LOBE	TYPE	MALE (40)		FEMALE (10)		TOTAL (50)		ST VALUE
		No	%	No	%	NO	%	
RIGHT	1	8	20	0	0	8	16	X2=3.311 Pvalue= 0.191
	11	3	7.5	2	20	5	10	
	111	29	72.5	8	80	37	74	
LEFT	I	7	17.5	2	20	9	18	X2=0.035 Pvalue= 0.983
	11	4	10	1	10	5	10	
	111	29	72.5	7	70	36	72	

Table 2 Types of origin of superior thyroid artery on both sides

Both sides	Type	Total no	Total %
	1	17	17
	11	10	10
	111	73	73



Figure1 -*Superior thyroid artery (STA) arising from Carotid bifurcation, (Type 1 origin) SLA=Superior laryngeal artery. CCA=common carotid artery. EBSLN=external branch of superior laryngeal nerve. IBSLN=Internal branch of superior laryngeal nerve.TC=thyroid cartilage. V=Vagus. IJV=internal jugular vein*

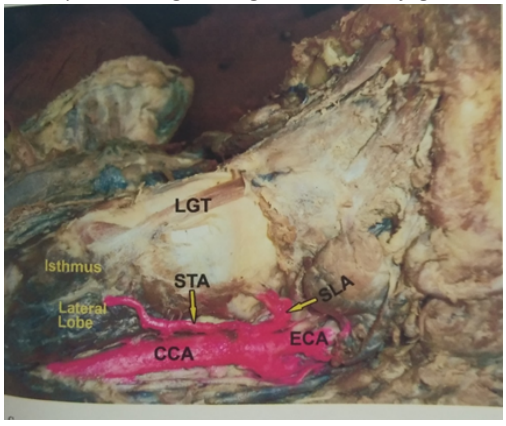


Figure 2-*Superior thyroid artery(STA) arising from Common Carotid artery (CCA),(Type 11origin)SLA=Superior laryngeal artery,.LGT=levator glandulae thyroidea*

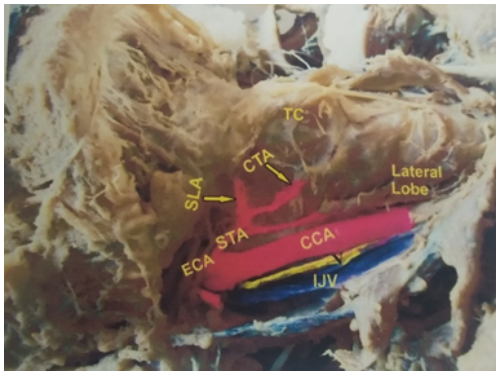


Figure 3-Superior thyroid artery (STA) arising from External carotid artery (ECA)-Type 111 origin. SLA-superior laryngeal artery.CTA-cricothyroid artery. CCA-common carotid artery. V=vagus. IJV-internal jugular vein .

DISCUSSION

Observations of the present study are discussed below.

In the present study, the superior thyroid artery was found arising from external carotid artery (Type111 origin) in 73%. This was followed by Type 1 origin in 17% of cases where the superior thyroid artery took origin from the carotid bifurcation and type 11 origin in 10% of cases where the superior thyroid artery arose from the common carotid artery. No cases of type 1Va and IVb were observed in this study

Table 3 Origin Of Superior Thyroid Artery As Observed By Other Authors

Name of Investigator	Type 1 (%)	Type11 (%)	Type 111(%)	Type 1Va (%)	Type 1Vb (%)
Adachi	27	13	59	-	1
Faller &Scharrer	36	18	46	-	-
Poissel &Goith	24	6	66	3	1
Lucev	22	47	30	1	-
Vazquez &Cobiella	49	27	23	0.6	0.4
Ozgur & Govsain	40	35	25	-	-
Present study	17	10	73	-	-

In the present study, the Type 111origin was the most common finding. This is consistent with the findings of Adachi (1928), Faller and Scharrer(1947) and Poissel and Golth(1974)

Vazquez and Cobiella observed that the most frequent origin of Superior thyroid artery was Type 1, in 49% observed; this was followed by almost equal distribution of Type 11 and Type 111 in 27% and 23% observed respectively

Type 1V Origin of superior thyroid artery from a common thyrolingual trunk (Type 1V a or from a common thyrolinguofacial trunk (Type 1Vb) has been rarely reported in literature

The thyrolingual trunk originating from the common carotid artery was described only twice in literature, once by Lemaire(2001) and then by Vazquez and Cobiella(2008)

Thyrolinguofacial trunk origin of superior thyroid artery has been reported only in sporadic cases .Aaron and Chawaf described this situation in 2% of cases in a radiological study. This value was found to be slightly higher when compared to the cadaveric study, although this could be due to different methodology used.

Kanta Roy in 2009, observed the frequent the frequent origin of the superior thyroid artery from the external carotid artery and then from carotid bifurcation and finally from the common carotid artery. He also observed double superior thyroid artery

No case of double superior thyroid artery or absence of superior thyroid artery was observed in the present study

CONCLUSION

The present work is a gross anatomical study on superior thyroid arteries. 50 thyroid glands were carefully dissected and photographs were taken to document each variation. Charts were prepared for the statistical an analysis of the data obtained. The percentage frequencies of each parameter in male and female groups were compared using chi-square test.

The difference in the value between the two study groups was found to be statistically insignificant (P value>0.05).

Superior thyroid artery was found taking origin commonly from external carotid artery, followed by carotid bifurcation and then the common carotid artery.

The findings in the present study with regard to superior thyroid artery gives a sound knowledge about the variations of this artery in this region while performing thyroidectomy.

REFERENCES

1. Aaron C,Chawaf AR,variations de la carotid externe et de ses branches Bull Assoc Anat 1967;13:125-134 as cited by Vazquez,Cobiella- Anatomical variations of the superior thyroid and superior laryngeal arteries.Head & Neck –DOI 10.1002/hed Aug.2009
2. Adachi B. Das Arteriensystem der japaner.Kyoto:Maruzen Co;1928 pp 54-82 as cited by Vazquez,Cobiella- Anatomical variations of the superior thyroid and superior laryngeal arteries.Head & Neck –DOI 10.1002/hed Aug.2009
3. Anderson RJ Abnormal Arrangement of the thyroid arteries Anat Physio 1880 April 14(pf3):353-356
4. Dasler E H and BJ Anson (1959) surgical anatomy of subclavian artery and its branches
5. Dedecjus.Evaluation of selective embolization of thyroid arteries as a preselective treatment in selected cases of toxic goiter.Thyroid research.2009,2:7
6. Faller and O Schaerer(1947-48) uber die variabitat der arteriae thyroidae Acta Anat

4:119-122 as cited by Ronald A Bergman,Adel K Afifi,Ryosuke Miyauchi,Superior thyroid artery. Illustrated Encyclopedia of Human Anatomical variation:OPUS 11:cardiovascular system:Arteries.Head ,Neck and Thorax
7. Kanta Roy Rimi, PostMortem study of thyroid arteries in Bangladeshi people.Bangladesh Journal of Anatomy.January2009 Vol-7 No 1 pp 26-33
8. Ozgur z, Govsain F,Celik S, Ozgur T. Clinically relevant variations of the superior thyroid artery :an anatomical guide for surgical neck dissection. Surg Radio.Anat 2008.Aug
9. Quain R: The anatomy of the arteries of Human body,London :Taylor & Walton 1844
10. Ronald A Bergman,Adel K Afifi,Ryosuke Miyauchi,Superior thyroid artery. Illustrated Encyclopedia of Human Anatomical variation:OPUS 2:cardiovascular system:Arteries.Head ,Neck and Thorax
11. Terayama- feeding artery of laryngeal and hypopharyngeal cancers:Role of the superior thyroid artery in super selective intraarterial chemotherapy.Cardiovascular and Interventional Radiology-Vol 29,Number 4/Aug 2007,page 536-543
12. Vazquez,Cobiella- Anatomical variations of the superior thyroid and superior laryngeal arteries.Head & Neck –DOI 10.1002/hed Aug.2009
13. Yamasaki M(1989) on the A thymica suprema, a provisionally named branch of the superior thyroid artery in the human.Anat Anz Jena168:329-335.