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Arterial Supply of Thyroid Gland and It's Anatomical Variation in Human Cadavers of Jharkhand Population

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Abstract

Background: The thyroid gland has a rich vascular supply with frequent anatomical variations that are crucial during surgical procedures. Understanding the origin, course, and relations of thyroid arteries is essential to prevent complications and improve surgical outcomes in thyroid and neck surgeries.

Objectives: To study the origin, branching pattern, course, and anatomical variations of superior and inferior thyroid arteries and their relationship with laryngeal nerves in cadavers from the Jharkhand population.

Methodology: This observational cadaveric study was conducted over 1.5 years on 16 embalmed cadavers (32 sides) in the Anatomy Department of RIMS, Ranchi. Standard dissection techniques were used to expose thyroid vasculature. Parameters assessed included origin, level, branching pattern, diameter, length, and nerve relations of superior and inferior thyroid arteries. Measurements were taken using digital calipers, and data were analyzed using SPSS version 26. Ethical approval was obtained prior to the study.

Results: The superior thyroid artery (STA) originated predominantly from the external carotid artery (87.5%) and most commonly above the upper border of thyroid cartilage (65.62%), with no significant side differences ($p>0.05$). Type III STA was most frequent (87.5%). Mean STA length was comparable on both sides (right: 5.74 cm; left: 5.76 cm), with similar diameters. The inferior thyroid artery (ITA) arose mainly from the thyrocervical trunk (93.75%), most commonly between the 8th and 10th tracheal rings (78.12%). ITA branching occurred more frequently after capsule penetration (68.75%). The recurrent laryngeal nerve was anterior

(50%), posterior (34.37%), or between branches (12.5%) of ITA. One case (3.12%) showed absence of right ITA, compensated by thyroidea ima artery. No statistically significant differences were observed between sides in all parameters studied.

Conclusion: Thyroid arterial anatomy shows significant variations, particularly in origin and nerve relations. Awareness of these variations is critical for safe thyroid surgery, minimizing vascular injury and nerve damage, thereby improving surgical precision and patient outcomes in thyroid and neck procedures.

Keywords: Thyroid gland, Superior thyroid artery, Inferior thyroid artery, Anatomical variation, Recurrent laryngeal nerve

Introduction

The word "Thyroid" comes from the Greek word "Thyreos," which means "large oval shield" and was used by Hellenistic forces. The thyroid gland is an organ with a lot of blood vessels. Surgeons who do thyroid surgeries should have a good idea of the anatomy of the arteries and nerves that connect to them[1]. In about 10% of people, a small thyroidea ima artery that is not connected with anything else comes out of the brachiocephalic trunk. But it could come from the upper artery or the aortic arch. Hypothyroidism, hyperthyroidism, autoimmune thyroiditis, Graves' disease, and goitre (caused by a lack of iodine) are all diseases that affect the thyroid gland. Goitre is the most common illness[2].

Anatomical differences can affect the disease, the clinical exam, the probe, and the patient's care, which may include surgery on the thyroid gland. The upper part of the airway is covered by the thyroid gland, which is between vertebrae C5, C6, C7, and T1. It has a junction that connects two lobes that are identical to each other[3]. There is a true capsule and a fake capsule that surround the gland. The pyramidal lobe is a small part of the gland material that usually sticks up from the isthmus[4]. It is located to the left of the midline. The thyroid gland is mostly fed by the Superior Thyroid Artery (STA) and the Inferior Thyroid Artery (ITA) [5].

The thyroidea ima artery is a branch of the aortic arch or the brachiocephalic trunk. Still, studying all parts of anatomy on cadavers is the best way to do it. As a result, this work will help the doctors[6]. The "superior thyroid artery" comes from the "carotid artery" on the outside, and the "inferior thyroid artery" comes from the "thyrocervical trunk." All of these arteries are one, except for the "thyroidea ima artery," which is seen in one case. The first part of the superior thyroid artery starts above the top edge of the thyroid cartilage. The second part of the inferior thyroid artery starts between the eighth and tenth tracheal rings[7].

For this reason, understanding the changes in the anatomy of the thyroid gland's blood flow is important for regular thyroid surgery. To do surgery on the thyroid or neck, you need to know about the usual and abnormal changes in the thyroid's blood vessels. The present study was conducted to assess the branching pattern and origin of the superior and inferior thyroid arteries and to evaluate the variation in origin, its branching pattern and differences between superior and inferior thyroid arteries.

Material and Methods

The present observational study was conducted for a duration of one and half year on 16 embalmed human cadavers in Anatomy department, Dissection Hall, Rajendra Institute of Medical Sciences, Ranchi. A total of 32 male cadavers with range of ages featured, donated and unclaimed dead body for measuring the length of superior and inferior thyroid artery were included. The cadavers whose thyroidectomy had previously done or cadavers whose neck surgery was already done were excluded.

In accordance with the method outlined in Cunningham's manual, Volume 3. skin and then subcutaneous tissue containing platysma was removed[8]. Deep fascia and sternocleidomastoid muscle were moved Laterally to reveal the thyroid gland. Infrathyroid and infrahyoid muscle were also reflected. The vein and artery in connection with the thyroid gland were then shown. With a recurrent laryngeal nerve, the lower portion of the thyroid gland is visible from the esophageal and tracheal lateral surfaces.

Materials used were Digital Vernier caliper, threads, scale and Hand lens, Dissection was performed using standard dissecting instruments like Forceps (toothed & smooth), Scissors (small and large), BP Handle and BP Blade, Digital Vernier calipers and Scale, Pin and Threads. The data was collected after getting approval from the Institutional Ethics Committee. All the measurement and gross findings were tabulated for analysis of data.

The superior thyroid artery's origin site - Either from the common carotid artery, the external carotid artery, or the bifurcation of the common carotid artery.

The superior thyroid artery’s origin level - on the upper border of the thyroid cartilage, either above or below it.

The quantity of superior thyroid arteries, whether one or two are present. From its starting point to the apex of the thyroid gland's lateral lobe, the superior thyroid artery's main trunk length in centimetre was measured. The external diameter of the superior thyroid artery in millimeters was measured. Relation between STA & ELN at the superior pole - whether it lies lateral or medial.

Types of STA- whether it is type I, type II, type III, Type IVa, type IVb. The Aspect of the origin of the STA - whether medially, anteromedially or postero-medially. The inferior thyroid artery's origin site - from the common carotid artery, vertebral artery, subclavian artery, and thyrocervical trunk. The inferior thyroid artery's origin level - between the sixth and eighth tracheal rings, between the eighth and tenth tracheal rings, and between the tenth and fourteenth tracheal rings. The Level at which Inferior thyroid artery enters the Thyroid gland - Near the higher pole, at the intersection of the upper 2/3 and lower 1/3, or through isthmus or lower pole. Relation between ITA & RLN - in front of, behind, or between the inferior thyroid arteries. The inferior thyroid artery's level of branching - Before piercing the capsule, after piercing the capsule.

The Observations were recorded in work sheet. Relevant finding was photographed and data analysis was done using SPSS Version 26.0.

Results

Table 1: Details of Origin of Superior Thyroid Artery (STA):

Details of Origin of Superior Thyroid Artery (STA)		Rt side (n=16) (%)	Lt side (n=16) (%)	Total (n=32) (%)	P value
Level of Origin of	Above upper border of thyroid cartilage	12(75.0%)	9(56.25%)	21(65.62%)	0.220

STA	At level of upper border of thyroid cartilage	1 (6.25%)	0 (0.0%)	1 (3.12%)	
	Below upper border of thyroid cartilage	3(18.75%)	7(43.75%)	10(31.25%)	
Site of Origin	External Carotid Artery	14 (87.5%)	14 (87.5%)	28 (87.5%)	1.00
	Common Carotid Bifurcation	1 (6.25%)	1 (6.25%)	2 (6.25%)	
	Common Carotid Artery	1 (6.25%)	1 (6.25%)	2 (6.25%)	
Aspect of Origin	Medial to artery	16 (100%)	13 (81.25%)	29 (90.62%)	0.226
	Anteromedial to artery	0 (0.0%)	2 (12.5%)	2 (6.25%)	
	Posteromedial to artery	0 (0.0%)	1 (6.25%)	1 (3.12%)	

Only 6.25% of the origins on the right side began at the same level as the top border of the thyroid cartilage, whereas 18.75% did so below it. This means that 75% of the origins were above the upper border. 56.25% of the origins on the left side were above the thyroid cartilage's top border, 43.75% were below it, and none were at the same level. Origins were distributed as follows: 31.25% were below the top border, 3.12% were at the same level, and 65.62% were above it. The p-value of 0.220 indicates that there is no appreciable difference between the right and left sides of the STA's level of origin.

On both sides, the external carotid artery was responsible for 87.5% of the sources. The remaining 12.5% of sources were similarly distributed across the common carotid artery and the common carotid bifurcation, with 6.25% on each side. The common carotid artery and the common carotid bifurcation accounted for 6.25% of the STA's sources, whereas the external carotid artery accounted for 87.5%. The p-value of 1.000 indicates that there is no appreciable variation between the right and left sides of the STA's site of genesis.

While 81.25% of the instances on the left had a medial origin, 12.5% had an anteromedial origin, and 6.25% had a posteromedial origin, all cases (100%) on the right side displayed a medial origin of the STA. Medial origins accounted for 90.62% of all STA origins, anteromedial origins for 6.25%, and posteromedial origins for 3.12%. The p-value of 0.226 indicates that there is no appreciable variation between the right and left sides of the STA's aspect of origin.

Table 2: Details of Superior Thyroid Artery (STA):

Details of Superior Thyroid Artery (STA)		Rt side (n=16) (%)	Lt side (n=16) (%)	Total (n=32) (%)	P value
Type of STA	Type I	1 (6.25%)	1 (6.25%)	2 (6.25%)	1.00
	Type II	1 (6.25%)	1 (6.25%)	2 (6.25%)	
	Type III	14 (87.5%)	14 (87.5%)	28 (87.5%)	
External Diameter of	2mm	3	3	6	0.874
	2.1mm	1	2	3	

STA (mm)	2.2mm	4	2	6	
	2.3mm	3	2	5	
	2.4mm	2	3	5	
	2.5mm	1	4	5	
	2.6mm	1	0	1	
	3mm	1	0	1	

6.25% of the cases on both sides were categorized as Type I, and another 6.25% as Type II. On both the right and left sides, Type III was assigned to the vast majority of instances (87.5%). Neither Type IVa nor Type IVb instances were identified. In total, Type III cases made up 87.5% of the cases, whilst Type I and Type II cases each made up 6.25%. The p-value of 1.000 indicates that there is no appreciable variation between the right and left sides of the STA's site of genesis. Since the expected count for four cells is less than five, Fisher's exact test is employed. The bare minimum expected count is the first.

The STA's average length is 5.76±1.16 cm on the left and 5.74±0.66 cm on the right. Since there is no statistically significant difference in the lengths of the STA on the left and right sides, the p-value of 0.951 indicates that they are very close.

The STA's mean outer diameter is 2.29± 0.25 mm on the right side and 2.27±0.19 mm on the left. The outer diameter of the STA is almost the same on both sides, as evidenced by the p-value of 0.636, which reveals no statistically significant difference between the right and left sides. Since the expected count for 16 cells is less than 5, Fisher's exact test is employed, with a minimum predicted count of 0.50.

Graph 1:

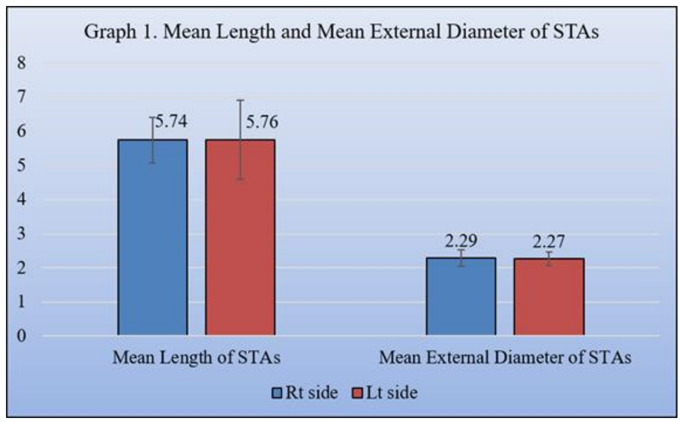


Table 3: Details of Origin of Inferior Thyroid Artery (ITA):

Details of Origin of Inferior Thyroid Artery (ITA)		Rt side (n=16) (%)	Lt side (n=16) (%)	Total (n=32) (%)	P value
Level of Origin of STA	6th to 8th tracheal ring	3(18.75%)	2(12.5)%	5(15.625%)	0.654
	8th to 10th tracheal ring	12(68.75%)	12(87.5%)	25(78.125%)	
	10thto14th tracheal ring	0	2(12.5%)	2(6.25%)	
Level of branching of ITA	Artery divided before piercing the capsule	6(37.5%)	3(18.75%)	9(28.12%)	0.252
	Artery divided after piercing the capsule	9(56.25%)	13(81.25%)	22(68.75%)	

Site of origin of the ITA	Thyrocervical Trunk	14(87.5%)	16(100%)	30(93.75%)	0.484
	Common carotid Artery	1(6.25%)	0	1(3.12%)	
	Absence of ITA	1 (6.25%)	0	1(3.12%)	
Level at ITA enters Thyroid Gland	At the junction of upper2/3 with lower 1/3	12(75%)	14(87.5%)	26(81.25%)	0.792
	Near the upper pole	2(12.5%)	1(6.25%)	3(9.37%)	
	Near the lower pole	1(6.25%)	1(6.25%)	2(6.25%)	

18.75% of the ITA origins on the right side were situated between the sixth and eighth tracheal rings, 68.75% between the eighth and tenth tracheal rings, and none between the tenth and fourteenth tracheal rings. 12.5% of the origins on the left side fell between the sixth and eighth tracheal rings, 87.5% between the eighth and tenth, and 12.5% between the tenth and fourteenth tracheal rings. Of the origins, 15.625% fell between the sixth and eighth tracheal rings, 78.125% between the eighth and tenth, and 6.25% between the tenth and fourteenth tracheal rings. The ITA's origin pattern appears to be comparable on both sides, as indicated by the p-value- 0.654, shows no discernible difference between the ITA's right and left sides in terms of level of origin.

"The inferior thyroid artery's (ITA) degree of branching on the left and right sides is displayed in the table". Of the ITA on the right side, 37.5% branched prior to capsule piercing, and 56.25% did so following capsule piercing. 18.75% of the ITA on the left side branched before to capsule piercing, and 81.25% branched following capsule piercing. In total, 68.75% of ITA branches happened after the capsule was punctured, whereas 28.12% happened before. The ITA's branching pattern appears to be comparable on both sides, as indicated by the p-value-0.252, which shows no discernible difference between the right and left sides. Fisher's exact test is used since the predicted count for four cells is fewer than five. 0.5 is the bare minimum predicted count.

87.5% of the ITAs on the right side came from the thyrocervical trunk, 6.25% from the common carotid artery, and 6.25% weren't there. None of the ITAs on the left side came from the common carotid artery or were absent; all of them came from the thyrocervical trunk. The thyrocervical trunk accounted for 93.75% of all ITAs, followed by the common carotid artery with 3.12% and the absence of 3.12%. There were no instances of ITA that came from the vertebral or subclavian arteries. The p-value of 0.484, which indicates no appreciable difference between the right and left sides in the ITA's place of origin, suggests that the majority of ITAs on both sides seem to come from the thyrocervical trunk.

On the right side, 12.5% of the ITAs entered close to the higher pole, 6.25% entered close to the lower pole, and 75% entered at the point where the upper two-thirds and lower one-third of the thyroid gland meet. On the left, 6.25% of the ITAs entered close to the upper pole, 6.25% entered close to the lower pole, and 87.5% entered at the same intersection (upper two-thirds and lower one- third). No reports of the ITA entering at the isthmus were found. Overall, 81.25% of the ITAs entered at the junction of the thyroid gland's lower third and upper two thirds, 6.25% arrived at the lower pole, and 9.37% entered near the higher pole. There is no difference between both sides in the level at which the ITA penetrates the thyroid gland, suggests similar patterns of entrance on both sides (p-value of 0.792).

Table 4: Relationship, Types and Length of Inferior Thyroid Artery (ITA):

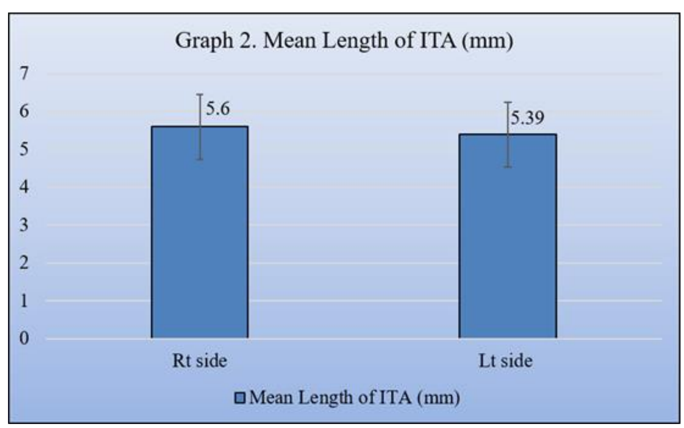
Relationship, Types and Length of Inferior Thyroid Artery (ITA)		Rt side (n=16) (%)	Lt side (n=16) (%)	Total (n=32) (%)	P value
Relationship, of Origin of ITA	Nerve anterior to Inferior thyroid artery	6(37.5%)	10(60%)	16(50%)	0.269
	Nerve Posterior to Inferior thyroid Artery	6(37.5%)	5(31.25%)	11(34.37%)	
	Nerve between the branches of artery	3(18.75%)	1(6.25%)	4(12.5%)	
Types of ITA	Type1	6(37.5%)	5(31.25%)	11(34.375)	0.378
	Type2	6(37.5%)	10(62.5%)	16(50%)	
	Type4	3(18.75%)	1(6.25%)	4(12.5%)	

The nerve on the right side was situated between the branches of the ITA in 18.75% of cases, before the ITA in 37.5% of cases, and behind the ITA in 37.5% of cases. On the left side, the nerve was between the branches of the ITA in 6.25% of cases, anterior to the ITA in 60% of cases, and posterior to the ITA in 31.25% of cases. Overall, the RLN was between the ITA's branches in 12.5% of cases, anterior to the ITA in 50% of cases, and posterior to the ITA in 34.37% of cases. The p-value of 0.269 indicates that there is no discernible difference between the right and left sides in the association of the ITA with the RLN and that the pattern of nerve placement concerning the ITA is the same on both sides.

On the right side, Type 1 accounted for 37.5% of the ITAs, Type 2 for 37.5%, and Type 4 for 18.75%. There were no Type 3, Type 5, Type 6, or Type 7 ITAs. Of the ITAs on the left, Type 1 accounted for 31.25%, Type 2 for 62.5%, and Type 4 for 6.25%. There were no Type 3, Type 5, Type 6, or Type 7 ITAs. Of all ITAs, Type 1 accounted for 34.375%, Type 2 for 50%, and Type 4 for 12.5%. The distribution of ITA types on the right and left sides appears to be quite equal, as indicated by the p-value of 0.378, which shows no discernible difference between the two sides.

The average length of the ITA is 5.60 and 5.39 centimeters on the right and left sides, respectively. The p-value of 0.579, which indicates no statistically significant difference between the right and left sides, suggests that the length of the ITA appears to be similar on both sides.

Graph 2:



Right superior thyroid artery: "The right external carotid artery served as the origin of the right superior thyroid arteries, which were unique in each of the 16 cases. As was customary, they all had two terminal branches—anterior and posterior—that supplied the anterior, medial, and lateral surfaces as they travelled toward the right side's superior pole. The right external laryngeal nerves at the superior pole were situated anteriorly and laterally to the right superior thyroid arteries in each instance".

Left superior thyroid artery: "The left external carotid arteries were the source of the left superior thyroid arteries, which were unique in each of the 16 cases. As was customary, they all had two terminal branches—anterior and posterior—that supplied the anterior medial and lateral surfaces as they proceeded toward the left side's superior pole. The left external laryngeal nerves at the superior pole were always situated anteriorly and laterally to the left superior thyroid arteries".

Right inferior thyroid artery: "The right inferior thyroid arteries were observed in 15 out of 16 cases. In one case, the right inferior thyroid artery was absent. In this case, the right inferior pole of the gland was receiving blood from the lateral branch of the thyroid ima artery. The thyroidea ima artery has medial and lateral terminal branches and was derived from Arch of Aorta. The medial branch supplied the isthmus, whereas the lateral branch fed the thyroid gland's lower pole on the right side."

"The left inferior thyroid arteries were found in all 16 cases. They were isolated and originated from the left thyrocervical trunk. They proceeded toward the lower pole of the left lobe before turning back to terminate as superior and inferior branches within the gland. The link between the left inferior thyroid artery and the left recurrent laryngeal nerve was changed at the lower pole. The left inferior thyroid artery was situated anterior to the left recurrent laryngeal nerve in 11 out of 32 instances (34.375%) and posterior to the nerve in the remaining 40% of cases."

16 out of 32 cases (50%) and in 4 out of 32 (12.5%) cases nerves lies in between the branches of artery.

"The thyroidea ima artery was found in only 1 case (3.125%). In present study it was from Arch of Aorta to the thyroid glands isthmus. It ended by producing two branches: a lateral branch that fed the right lobe's inferior pole and a medial branch that directly supplied the thyroid gland's isthmus. It's interesting to note that in this instance, the thyroidea ima artery's lateral branch served as the gland's only source of blood to the right lower pole, replacing the missing right inferior thyroid artery. Furthermore, in the right lower pole of the gland, it was discovered that the right recurrent laryngeal nerve was passing posterior to the lateral branch of the thyroidea ima artery."

Discussion

"The ITA, which originates from the subclavian artery's thyrocervical trunk, and the STA, which originates from the external carotid artery, provide the majority of the thyroid gland's supply. The pre-tracheal artery and the TIA can occasionally act as extravascular supply[9]." The frequency and pattern of these variations, however, vary widely across populations. Ethnicity, genetics, and environment may be contributory factors for these variations[10]. In the population of Jharkhand, cadaveric studies have revealed a high incidence of such aberrant vascular supplies, which will influence surgical planning[11].

Earlier studies previously done on South Asian populations gave information regarding the overall vascular anatomy.

Types of origin of superior thyriod artery:

Livini F et al[12] observed that 9% STA was type II and 1% was type IVa. There was no type I, Type III & type IVb. Aaron and Chawaf[13] observed that 27% of cases were type I, 13% of cases were type II and 59% of cases was type III and 2% of cases were type IVa and no cases of type IVb. Poissel and Golth[14] observed that 24% of cases were type I, 6% of cases were type II, 66% of cases was type III, 3% of cases were type IVa and 1% were type IVb. In Present study 6.25% cases were type I, 6.25% cases were type II and 87.5% cases was type III. There was no type IVa and type IVb. This is almost similar to other previous studies.

Comparison of origin of superior thyroid artery in various studies:

Pushpalatha et al (2015)[15] found that in 68% cases STA arose from ECA which was first most common site of origin of STA. In 8% cases STA arose from CCB which was the third most common site of origin of STA. In 24% cases STA arose from CCA which was the second most common site of origin. Shiva Leeta et al (2016) [16] found that in 76.19% cases STA arose from ECA which was the first most common site of origin. In 21.43% cases STA arose from CCB which was the second most common site of origin In 2.38% cases STA arose from CCA which was the least common site of origin.

Vijay Lakshmi et al (2017) [17] observed that in 48.33% cases STA arose from ECA which was first most common site of origin of STA. In 35% cases STA arose from CCB and in 15% cases it arose from common carotid artery. which was third most common site of origin. Veena Vidya Shankar et al (2017) [18] shown that in 53.75% cases STA arose from ECA which was first most common site of origin. In 31.25% cases it arose from CCA which was second most common site of origin and in 15% cases it arose from CCB which is third most common site of origin. In present study, STA arose from ECA was observed in 87.5% cases which was first most common site of origin like other various studies. In 6.25% cases it arose from common carotid artery and in 6.25% cases it arose from common carotid bifurcation. Which are almost similar to other various studies.

Comparison of mean length of main trunk of superior thyroid on both sides in various studies:

Vijay Lakshmi et al (2017) [17] found that mean length of STA on Right side was 3.56 and on left side was 3.66. Veena Vidya Shankar et al (2017) [18] found that mean length of STA on Right side is 4.48+1.53 cm and on left side is 4.28+1.30 cm. In Present study the mean length of the STA was found to be 5.74+0.66 cm in right side and 5.76+1.16cm in left side which is slightly higher than that have been reported in two other studies [67,33]

Comparison of level of origin of superior thyroid artery in various studies:

In 3.5% cases STA arose below that level of Upper border of thyroid cartilage. Abhijeet Joshi et al (2014) [19] found that in 86.36% cases STA arose above the level of upper boarder of thyriod cartiage which was first most common level of origin. No any cases originated below the level of upper border of thyriod cartilage was observod. In 13.64% cases STA arose at the same level of upper border of thyriod cartilage which was the second most common level of origin. Pushpalatta et al (2015) [15] seen that in 48% cases STA arose above the level of upper border of cartilage which was first most common level of origin of STA. In 36% of cases it arose at same level of upper border of cartilage it is second most common level of origin of STA. In 6% cases it arose below the level of upper border of cartilage it was third least common site of origin of STA.

Shivaleela et al (2016)[16] found that in 88.09% cases STA arose above that level of upper border of cartilage it was first most common level of origin of STA. No any case arose below the level of cartilage. In 11.9% cases STA arose at the same level of cricoid cartilage origin of STA. Veena Vidya Shankar et al (2017)[18] found that in 73.75% cases it arose above the level of cartilage which was first most common level of origin. In 16.25% cases it arose at the same level of upper border of cartilage. It is second most common site. In 10% cases it arose below the level of cartilage. It is third least common site of origin.

In Present study, in 65.62% cases STA arose above the level of upper border of cartilage which is first most common level of origin and are similar to many other previous studies. The second common level of origin in present study is 31.25% which is below the upper of thyroid cartilage. This level is not second most common level in any other previous studies. In other studies it is least common level of origin of STA except Kanta Roy et al (2009)[20] study. In their study it is first most common level of origin of STA. In 3.12% cases STA arose at the same level of upper border of cartilage. It is third least common level of origin of STA. In other previous studies it was second most common level of origin of STA.

Incidence of absent[i] inferior thyroid artery:

Bowden et al (1955)[21] observed that in 6.66% cases ITA was absent on left side. On Right side in all cases ITA was present. Gandhi et al (1971)[22] observed that in 8% cases ITA was absent on left side and in 2% cases ITA was absent on Right side. Chandrakala S P et al (2013)[23] showed that on left side in 6.25% cases ITA was absent and on right side in 3.75% cases ITA was absent. In Present study on Right side in one case (6.25%) ITA was absent and on left side in all cases ITA was present. Overall in 3.125% cases ITA was absent. In present study in 6.25% cases, on right side ITA was absent.

In study by Bowden et al (1955)[21] the ITA was absent which was 6.66%. which are approximately similar to present study. In Gandhi et al (1971)[22] study it is slightly higher 8% and in[68] study it is 7.14%. Faller and Sharer[24] shown that the thyroidea ima artery was main source in place of on ITA. Yi Imaz et al[15] shown a case of thyroidea ima artery arose from the Brachiocephalic trunk. The ITA was absent on both sides. Faysal et al[26] observed the presence of thyroidea ima artery originated from Brachio-cephalic Artery. On the left side the ITA was absent.

Amanuel T. Tsegay et at[27] shown that, in all cases, ITA arose from the Thyrocervical trunk. In 21.87% cases ITA arose from 6th to 8th tracheal ring and in 68.75% cases ITA arose from 8th to 10th tracheal ring and In 9.375% cases was originated from 10th to 14th tracheal rings. In 100% cases ITA was single. Abhijeet et al[19] shown that in 100% cases, ITA arose from Thyrocervical truck on left side. on Right side in 96% cases it arose from Thyro-cervical trunk and in 4% cases arose from subclavian artery.

Comparison of the Between RLN with ITA:

Uen Hy et al (2006)[28] observed that on right side Type I was 61.6% Type 2 was 20% and Type 4 was 18.4%. On left side Type was 70% Type 2 was 8.3%. and Type 4 was 21.7%. There were no Type 3, type 5, type 6 and type 7 ITA on both sides. Sun SQ et al (2001)[29] found that on Right side, type I was 22%, type 2 was 50% and type 4 was 12% ITA and type 7 was 2%. On left side, type I was 56%, type 2 was 14% type 4 was 16% and type 7 was 14%. There was no type 3,5,6 on both sides. Hirata K (1992)[30] found that on Right side type I was 26.7%, type 2 was 32.4%, type 4 was 40.9%, On left side type I was 65.8%, type 2 was 4.9% and type 4 was 29.3%. There were no type 3, type 5, type 6 and type 7 on both sides.

In present study, on Rt side, type 1 was 37.5% type 2 was 37.5%, type 4 was 18.75%. On left side type 1 was 31.25%, type 2 was 62.5% and type 4 was 6.25%. There was no type 3 type 5, type 6, and type 7, which was similar to other previous studies except Sun S Q et al (2001)[29] study where type 7 was also present.

Conclusion

This study examines the blood flow to the thyroid gland and how it varies across Jharkhand residents. The "superior thyroid artery" (STA) primarily originates from the ECA, while it can occasionally come from the CCA or its bifurcation. The STA often begins above the upper border of the thyroid cartilage. There is no discernible change between the left and right sides. The STA is near the "external laryngeal nerve" (ELN), which is crucial for controlling voice.

The “recurrent laryngeal nerve” (RLN), which is also involved in voice regulation, can run very close to the ITA, creating a challenging surgical environment due to its delicate positioning. In some cadavers, further uncommon thyroid structures were found, such as the pyramidal lobe and levator glandular thyroid. It is also useful for radiologists and vascular specialists who intervene in the neck area, knowing these variations. The anatomical changes must be known properly so that the best surgeries can be done safely, nerves damaged, and patient outcomes can be augmented.

In present Study, In one case Right Inferior thyroid artery was absent. Thyriodea Ima artery was present in that case to provide Blood to gland. STA and ITA can have abnormal origins so accurate identification and hence correct Ligation, is challenging. Due to incomplete ligation of these vessels, excessing bleeding can occur or an insufficient amount of blood can be delivered to the thyroid and parathyroid gland and thus surgery becomes more dangerous.

Limitations

The small size of the sample is one of the primary limitations observed in this study. The findings of the study are region specific as the study was undertaken exclusively on cadavers, which were collected only from Jharkhand. As the study is restricted to a certain demographic, it is considered a major limitation of the study.

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