

MORPHOMETRIC STUDY OF INFERIOR THYROID ARTERY IN CADAVERS

Roshan S. *¹, Nivedita Pandey ², Varsha Bhivate ³, Rahul P Kharate ⁴.

¹ Assistant Professor, Srinivas Institute of Medical Sciences & Research Centre (SIMS &RC), Mangalore, Srinivas University, Karnataka, India.

² Assistant Professor, BPKIHS, Dharan, Nepal.

³ Assistant Professor, Terna Medical College, Nerul, Navi Mumbai, Maharashtra, India.

⁴ Assistant Professor, MGM Medical College, Navi, Mumbai, Maharashtra, India.

ABSTRACT

Background: Thyroid gland is one of the vital organs in neck region. It is highly vascularized and variations of the thyroid arteries are frequent and have been well documented in literature. This fact increases the significance of being cautious about thyroid gland while performing surgery in neck region.

Objective: To study the morphological anatomy of Inferior thyroid artery and to report the origin of the Inferior thyroid artery, to measure the length of the Inferior thyroid artery from its origin to its entry into the gland, to measure the distance from the midline of the neck to the entry of the Inferior thyroid artery into the thyroid gland and to trace its branches.

Method: A total of fifty human cadavers were dissected at anatomy department dissection hall of MGM Medical College, Navi Mumbai, Maharashtra and the measurements were taken as per objective of the study.

Results: Inferior thyroid artery originated from the thyrocervical trunk in all cases on the left side. On right side in 48 out of 50 cadavers, it originated from thyrocervical trunk (96%) and in rest two cases it originated from the subclavian artery (4%). Statistically significant variation ($p < 0.001$) of mean length of inferior thyroid artery between the right and left side of cadaver was found, indicating mean length was more on left side. Statistically significant variation ($p < 0.001$) of mean distance from midline to entry of inferior thyroid artery into gland between the right and left side of cadaver was found signifying mean distance from midline was more on the right when compared to the left side.

Conclusions: Variations of inferior thyroid arteries are well documented in literature. To keep morbidity to minimum, surgeons should have extensive knowledge of the topographic anatomy and its variations.

KEY WORDS: Thyroid Gland, Morphology, Inferior thyroid artery, Cadaver.

Address for Correspondence: Dr. Roshan S., Assistant Professor, Department of Anatomy, Srinivas Institute of Medical Science & Research Centre (SIMS&RC), Srinivas University, Surathkal, Mangalore-574146, Karnataka, India. PH: +919480077030 **E-Mail:** kmcroshan@gmail.com

Access this Article online

Quick Response code



DOI: 10.16965/ijar.2015.328

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 03 Dec 2015 Accepted: 19 Dec 2015
Peer Review: 03 Dec 2015 Published (O): 31 Dec 2015
Revised: None Published (P): 31 Dec 2015

BACKGROUND

Thyroid is a very vascular endocrine gland and is supplied by a pair of superior thyroid and inferior thyroid arteries and occasionally by a thyroideaemia artery. Blood flow to the thyroid

gland is of the order of 100 ml/min (4 to 6 ml/gm/min) which is even more than renal blood flow, reflecting the importance of the thyroid hormone to the whole body metabolism. Thyroid gland receives this rich blood supply

mainly through paired inferior thyroid arteries [1].

Dissections have shown that the inferior thyroid artery is usually the larger artery to the normal thyroid gland and this vessel enlarges still more when the gland is goitrous. The inferior thyroid artery is generally larger than the superior, and on entering the hilus, the inferior thyroid artery forms the chief functional blood supply to the gland. So it is desirable to ligate this vessel in preference to the upper artery during surgeries [2].

Globally prevalence of goitre is estimated to be 12%. South-East Asia (including India, Bangladesh and Indonesia) and the Western pacific countries together account for more than 50% of the World's total population at risk for these disorders. Surgical treatment is preferred for most of these patients because it eliminates the bulk of the goitre, corrects the functional abnormality, and removes possible malignant neoplasms. Thyroidectomy is also indicated for mechanical and cosmetic reasons [3]. Because the thyroid gland is well vascularised, the dissection and cutting of the thyroid vessels is an essential part of every thyroid operation. Thyroid surgery is one of the most frequently done surgeries and is one of the most common procedures with possible serious complication.

So in this present work we have studied the origin of inferior thyroid artery, its length from origin, distance from midline to entry of artery to gland and so making it useful for surgeons in thyroid interventions.

MATERIALS AND METHODS

The present study was conducted in Department of Anatomy, MGM Medical College, Navimumbai, Maharashtra during June 2009 to December 2011. The study was conducted on 50 formalin preserved cadavers irrespective of the sex. The study technique consisted of dissection, observations and measurement of various parameters. The study protocol was prepared in the form of a proforma. Dissection was done by procedures suggested in Cunningham [4] and was done as following:

- A midline incision was made on skin from chin to sternum and skin was reflected laterally.

- Platysma was reflected upwards.
- Investing layer of deep fascia was incised and reflected.
- Sternocleidomastoid muscles of both sides were retracted laterally, or whenever needed sternal and clavicular heads were cut and reflected upwards.
- Infrahyoid muscles were identified and cut from the hyoid bone and thyroid cartilage and reflected downwards.
- Thyroid gland was exposed.
- Origin of inferior thyroid artery was observed and was traced from origin to thyroid gland. Its course and branches was observed.

The length of the inferior thyroid artery from origin to thyroid gland was measured with thread and with the help of scale it was computed. The distance from midline to the entry of artery into gland was assessed with thread and it was computed by measuring on ruler. (Fig 1(a), 1(b), 1(c)).

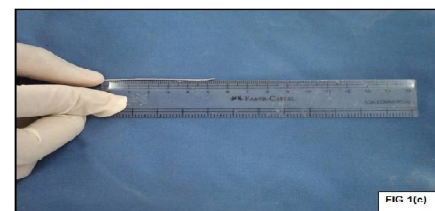
Fig. 1(a): Illustration showing the measurement of Length of Inferior Thyroid artery.



Fig. 1(b): Illustration showing the measurement of distance from midline to entry of artery into gland.



Fig. 1(c): Illustration showing the measurement on ruler.



RESULTS AND OBSERVATIONS

Origin of inferior thyroid artery: Inferior thyroid artery was found in both right and left side of the 50 cases dissected. It originated from the thyrocervical trunk in all cases (100%) on left side. On right side in 48 out of 50 sides it originated from thyrocervical trunk (96%) and in 2 cases it originated from the subclavian artery (4%)(Table 1, Fig. 2,3,4).

Table 1: Number and percentages of origin of inferior thyroid artery on right and left side.

	Measurements	Side		Total
		Right	Left	
Subclavian	Count	2	0	2
	%	4.00%	0%	2.00%
Thyrocervical trunk	Count	48	50	98
	%	96.00%	100%	98.00%
Total	Count	50	50	100
	%	100%	100%	100%

Fig. 2: Bar diagram showing origin of inferior thyroid artery on right and left side.

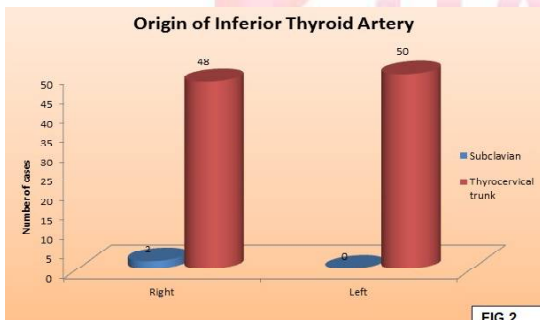


Fig. 3: Dissection showing normal Inferior Thyroid Artery.

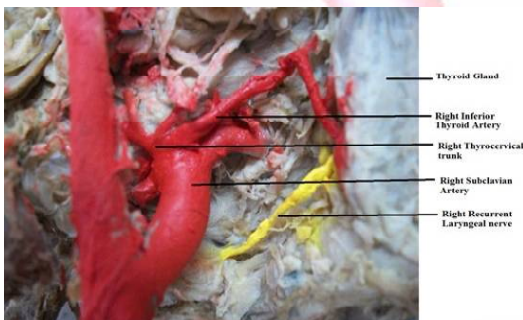


Fig. 4: Dissection showing Inferior Thyroid artery arising from Subclavian artery.



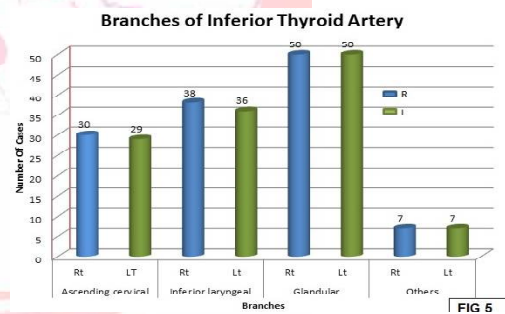
Branches of Inferior Thyroid Artery: The branches of inferior thyroid artery were studied. All the inferior thyroid arteries that were identified had glandular branches, which divided into anterior and posterior branches. The ascending cervical artery was frequently found in 59 out of 100 sides. The bodies used were mutilated as it was used for dissection by MBBS students, as a result of this the rest were found damaged during dissection (Table 2, Fig. 5).

Table 2: Branches of Inferior Thyroid artery (ITA).

Branches of ITA	Side		Total (100)
	Right	Left	
Ascending Cervical	30	29	59
Glandular	50	50	100
Inferior Laryngeal	38	36	74
Others *	7	7	14

*others: Tracheal branches, oesophageal branches

Fig. 5: Bar diagram showing branches of Inferior Thyroid Artery.



Length of Inferior Thyroid Artery: Length of inferior thyroid artery was measured from origin to entry of gland. There was statistically significant variation of mean length of inferior thyroid artery between the right and left side of cadaver ($p < 0.001$). (Table 3, Fig. 6, 7).

Table 3: Mean and Standard deviation of length of inferior thyroid artery.

Side	N	Maximum Length	Minimum Length	Mean	Std. Deviation	t
Right	50	6 cm	5 cm	5.384	0.21605	8.376
Left	50	6.1 cm	5.1 cm	5.764	0.23713	$p < 0.001$ vhs

vhs – very high significance

Fig. 6: Scatter graph showing length of inferior thyroid artery on right side.

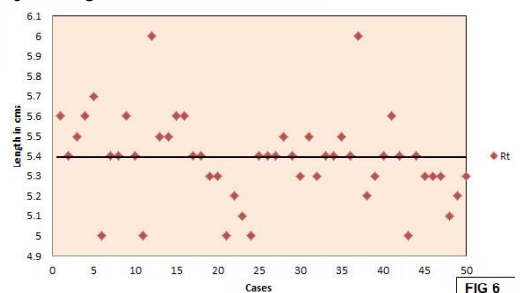
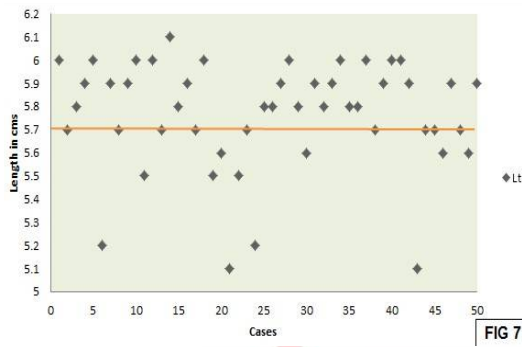


Fig. 7: Scatter graph showing length of inferior thyroid artery on left side.



Distance from midline to entry of inferior thyroid artery into the thyroid gland: The distance was measured from the midline of the neck to the entry of the inferior thyroid artery into the thyroid gland.

Table 4: Mean and Standard deviation of Distance from midline to entry of inferior thyroid artery into gland.

Side	N	Maximum Distance	Minimum Distance	Mean	Std. Deviation	t
Right	50	3.1 cm	2.7 cm	2.936	0.10451	10.435
Left	50	3 cm	2.4 cm	2.644	0.16801	p<0.001 vhs

vhs – very high significance

Fig. 8: Scatter graph showing distance from midline of neck to entry of inferior thyroid artery into gland of right side.

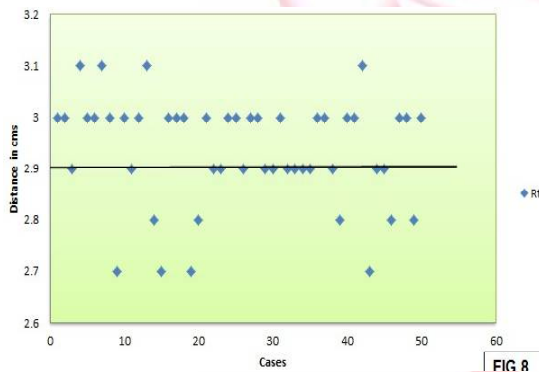
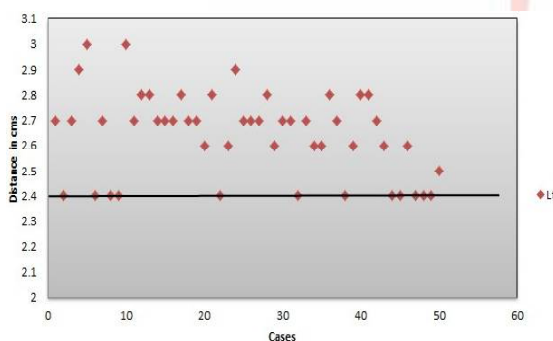


Fig. 9: Scatter graph showing distance from midline of neck to entry of inferior thyroid artery into gland of left side.



The study showed statistically significant variation of mean distance from midline to entry of inferior thyroid artery into gland between the right and left side of cadaver ($p < 0.001$) (Table 4, Fig. 8,9).

DISCUSSION

Inferior Thyroid Artery Origin: The knowledge of variations in the ramifications of arteries is of essential importance for the surgical and diagnostic procedures in the region of the neck. For this reason, the variations of the thyroid arteries require special attention. The inferior thyroid artery appears to be more variable than superior thyroid artery and it is even reported that it may be absent. In different populations, the absence of inferior thyroid has been differently reported – in the English in 0.2-2.2% of the cases studied, in Italians in 1.6%, in Americans in 2.3%, in Swiss in 3.6%, in Germans in 3.8% and in Japanese in 5.9% [5]. In our study there was no absence of the inferior thyroid artery.

The origin of inferior thyroid artery varies in different populations as being described by various workers. Most commonly it arises from the thyrocervical trunk.

Dasler and Anson (1959), dissected 775 specimens and stated that the inferior thyroid artery arises as a branch of thyrocervical trunk from the first part of the subclavian artery in 622 specimens (80.25%) in 301 cases was on the right side and in 321 cases was on left side. They also reported that it arises as an independent branch of subclavian artery in 125 cases out of 775 specimens (16.12%), 74 times on the right side and 51 times on the left side. They also observed various other variations in its origin like from common carotid, arch of aorta, vertebral artery etc.[6].

Kanta Roy Rimi et al (2009), presented a study performed on 57 cadavers. Inferior thyroid artery most commonly originated from thyrocervical trunk, on right 87% and left 90.2%, followed by subclavian artery, right 13% and left 9.80% [7].

Ronald A Bergman et al. (2011), in his study of 200 cadavers, found that the inferior thyroid artery arose from the thyrocervical trunk in 90.5%, subclavian in 7.5% and very rarely from

rarely from the common carotid, aortic arch, brachiocephalic or vertebral. Inferior thyroid artery was absent on right side in 2 cases and on left side in 5 cases [8].

In the present study 50 cadavers were dissected. On the left it was found that all the inferior thyroid arteries arose from the thyrocervical trunk, on the right in 48 cases it arose from the thyrocervical trunk and in 2 cases it arose directly from the subclavian artery (Table 5).

statistically significant variation of mean length of inferior thyroid artery between the right and left side of cadaver ($p < 0.001$) indicating mean length was higher on left compared to the right side.

Distance from midline to entry of inferior thyroid artery into the thyroid gland: There is no previous study done till date on distance from midline to entry of inferior thyroid artery into the thyroid gland. So in our present study,

Table 5: Origin of inferior thyroid artery.

Authors	Total artery	Thyrocervical trunk		Subclavian artery	
		Rt	Lt	Rt	Lt
Dasler and Anson (1959) [6]	775	301	321	75	51
		38.80%	41.40%	9.60%	6.50%
Kanta Roy Rimi et al (2009) [7]	114	87%	90.20%	13%	9.80%
Present study (2011)	100	48	50	2	--
		96%	100%	4%	--

Length of Inferior Thyroid artery: Length of inferior thyroid artery was measured from origin of artery to its entry into the thyroid gland to see if any difference exists between right side and left side.

Kanta Roy Rimi (2009) in their study on 57 cadavers measured the length of inferior thyroid artery. Length was measured only of main trunk i.e from origin of artery to where it divides into glandular branches. The mean +SD length of main trunk of inferior thyroid artery on the right side was 36.0 ± 7.5 mm and on the left side was 40.5 ± 7.1 mm. It was revealed that statistically significant variation of mean length of main trunk of inferior thyroid artery was found between right and left side of the cadaver ($p < 0.001$) indicating that the mean length was higher on the left side compared to the right side. It was also revealed that on each side, the mean length of main trunk of inferior thyroid artery significantly increased with increasing age of the cadaver ($p < 0.001$) [7].

In the present study, in 50 cadavers the length of Inferior Thyroid artery was measured from origin of artery to its entry into the gland. The mean + SD length on the right side was 5.3840 ± 0.216 cm and on the left side was 5.7640 ± 0.237 cm. Unpaired Student's 't' test was applied and it was revealed that there was

we have studied on this parameter so that it can help surgeons in dealing with surgeries on the thyroid gland.

The distance was measured from the midline of the neck to the entry of the inferior thyroid artery into the thyroid gland. The mean + SD distance from midline on right was 2.9360 ± 0.1045 cm and on the left side was 2.6440 ± 0.168 cm. Unpaired Student's 't' test was applied and it was revealed that there was statistically significant variation of mean distance from midline to entry of inferior thyroid artery into gland between the right and left side of cadaver ($p < 0.001$) designating mean distance from midline was more on the right compared to the left side.

CONCLUSION

In the present study it was found that inferior Thyroid Artery originated from the thyrocervical trunk in 100% cases (50 sides) on left side, whereas on the right side 96% (48 sides) from the thyrocervical trunk and in 4% (2 sides) directly from the subclavian artery. On the right side, length of Inferior Thyroid Artery had a mean value of 5.3840 ± 0.216 cm and on the left side mean value of 5.7640 ± 0.237 cm. The length was more on the left side compared to right side and it was statistically significant ($p < 0.001$). Distance

from midline of neck to the entry of Inferior Thyroid Artery was measured and the mean distance from midline on right was 2.9360 ± 0.1045 cm and on the left side was 2.6440 ± 0.168 cm. The distance from midline to entry of artery to gland was more on right side compared to left side which was found statistically significant ($p < 0.001$). Finding of this study will add to the literature in this regard and it will be useful for the surgeons to be careful about the frequent variations of the thyroid arteries to keep morbidity to minimum while performing surgery in the neck region.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. Karuna Katti and Dr. Ashok Gupta for their guidance in completing the study. Sincere thanks for the nonteaching staff of the department of anatomy of MGM Medical College, India. for their support.

Conflicts of Interests: None

REFERENCES

- [1]. James B. Snow Jr, John Jacob Ballenger. Ballenger's Otorhinolaryngology, Head and Neck Surgery. 16th ed. Spain: Williams and Wilkins; 2003. p. 1468-1469, 1478-1479.
- [2]. Lambert Rogers. The Thyroid arteries considered in relation to their Surgical importance. J Anat 1929 Oct;vol 64(Pt 1):50-61.
- [3]. Orlo H. Clark, Quan-Yang Duh. Textbook of Endocrine Surgery. 1st ed. Philadelphia: W. B. Saunders; 1997. p. 15,20.
- [4]. Romanes GJ. Cunningham's Manual of Practical Anatomy vol 3 Head and neck and brain. 15th ed. Oxford: Oxford University Press; 2000. p. 64-7.
- [5]. John E. Skandalkis, Gene L. Colborn, Thomas A. Weidman, Roger S. Foster Jr, Andrew N. Kingsnorth, Lee J. Skandalkis, et al, editors. Skandalkis Surgical Anatomy. New York: McGraw Hill; 2006. Chapter 1-Neck, Table 1-1.
- [6]. Dasler E. H and B. J. Anson. Surgical anatomy of the subclavian artery and its branches. SurgGyneObs 1959;109:149-174.
- [7]. Kanta Roy Rimi, Shamim Ara, Motahar Hossain, KM Shefayetullah, Humaira Naushaba, BK Bose. Postmortem Study of Thyroid Arteries in Bangladeshi People. Bangladesh Journal of Anatomy 2009 Jan;7(1): 26-33.
- [8]. Ronald A. Bergman, Adel K. Afifi, Ryosuke Miyauchi. Inferior Thyroid artery. Illustrated Encyclopedia of Human Anatomic Variation: Opus II: Cardiovascular System: Arteries: Head, Neck and Thorax. 2011 Apr 26; Available from: URL: [http://www.anatomyatlases.org/]

How to cite this article:

Roshan S, Nivedita Pandey, Varsha Bhivate, Rahul P Kharate. MORPHOMETRIC STUDY OF INFERIOR THYROID ARTERY IN CADAVERS. Int J Anat Res 2015;3(4):1726-1731. DOI: 10.16965/ijar.2015.328