

Original Research Article

A Prospective Study on Relation of Inferior Thyroid Artery with Recurrent Laryngeal Nerve at the Base of Thyroid Gland in Tamil Nadu Population

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ABSTRACT

Background: The risk of injuring recurrent laryngeal nerves can result in voice or swallowing problems can be a major complication during thyroid surgeries. Intraoperative injury to RLN can be an issue and can have a detrimental impact on patients' quality of life. The incidence of injury to recurrent laryngeal nerve worldwide ranges from 0.5 to 20%. To prevent such surgical complications of thyroid, a detailed anatomy of inferior vascular pedicle (inferior thyroid artery) and its relation to adjacent recurrent laryngeal nerve is required.

Aim: The aim of the study was, To find out the variable anatomical relationship between inferior thyroid artery and recurrent laryngeal nerve at the base of lateral lobes of thyroid gland.

Materials and methods: This descriptive study was conducted for a period of 72 months at the Department of Anatomy, Government Medical College, Omandurar Government Estate, Chennai-2, between January 2015 - January 2021 by dissection method in 60 adult (54 male and 6 female) cadavers (60 - right & 60 - left sides).

Results: Results were noted, tabulated and interpreted. It was found that the recurrent laryngeal nerve at the base of thyroid gland which was predominantly posterior on both sides (R-78.33%, L- 100%) to inferior thyroid artery and in 21.66% anterior to ITA on right.

Conclusion: The recurrent laryngeal nerve may lie anterior or posterior to inferior thyroid artery. In the present study, the recurrent laryngeal nerve was posterior most commonly on both sides to inferior thyroid artery. On the right, the second common presentation was the recurrent laryngeal nerve lying anterior to inferior thyroid artery.

KEY WORDS: Thyroid gland, Subclavian artery, Inferior thyroid artery, Recurrent laryngeal nerve.

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INTRODUCTION

Thyroid gland, with its two lateral lobes and isthmus extends from fifth or sixth tracheal

ring to the oblique line of thyroid cartilage. Being invested by pre-tracheal fascia, which is thickened posteriorly, as the ligament of Berry,

which is attached to the arch of the cricoid cartilage. Due to this posterior attachment the thyroid gland moves with larynx during deglutition [1].

The apex of each lateral lobe receives a superior thyroid artery and external laryngeal nerve. The base and deep structures of thyroid receive branches from inferior thyroid arteries and recurrent laryngeal nerve [1].

The inferior thyroid artery, is a branch of thyrocervical trunk of first part of subclavian artery. After looping with upward convexity at sixth cervical vertebral level it descends to reach the base of lateral lobe of thyroid. It enters the lower pole of the gland very close to recurrent laryngeal nerve [2].

The recurrent laryngeal nerve, a branch of Vagus (CNX) was described by Galen. It carries sensory, motor and parasympathetic fibres to laryngeal structures [2].

The recurrent laryngeal nerve on right, loops around the subclavian artery at the base of neck and on the left, loops around the arch of aorta below the ligamentum arteriosum. Then runs along the tracheoesophageal groove to enter into larynx posterior to cricothyroid articulation and deep to the inferior constrictor muscle [3].

At the inferior pole of thyroid, the right recurrent laryngeal nerve may cross anterior or posterior or in between, the branches of inferior thyroid artery. The left recurrent laryngeal nerve has a vertical ascent from superior mediastinum [3].

Hazem M. Zakaria et al [4] has quoted hoarseness was the usual sign of unilateral recurrent nerve injury. He also added that, temporary dysphonia or aphonia is usually transient lasting for a few days or months which can be attributed to oedema or traction injury or bruising or over handling of the recurrent laryngeal nerve during operative procedure [4]. If dysphonia persisted for more than six months, it can be due to a permanent damage to RLN which may have resulted as a result of cutting ligating or cauterization of the nerve [4]. Bilateral injury to RLN, is a medical emergency requiring tracheostomy due to airway obstruction [4].

OBJECTIVES: The aim of the study was to study the variable anatomical relationship between inferior thyroid artery and recurrent laryngeal nerve at the base of lateral lobes of thyroid gland.

MATERIALS AND METHODS

This descriptive study was conducted at department of Anatomy, Government Medical College, Omandurar Government Estate, Chennai-2 for a period of seventy two months between January 2015 to January 2021. After complete approval from Institutional Ethical Committee for the research protocol. About sixty adult cadavers (54 males and 6 females) aged between 50 - 75 years, were dissected. The adult cadavers were received from body donation after written informed consent. The cadavers were embalmed through femoral artery perfusion.

The methodology prescribed by Cunningham's Manual of dissection was carried out after incising the skin from chin to sternum in midline and reflected the skin flap infero-laterally. Platysma was reflected upwards keeping close to its deep surface. A transverse incision through the investing layer of deep cervical fascia was made from above the sternum and both sternocleidomastoid were reflected laterally. The deep cervical fascia was removed from below hyoid, which exposed the infrahyoid muscles between hyoid and sternum on both sides. The superior belly of omohyoid was displaced laterally. The infrahyoid muscles were separated in the midline to expose the pretracheal fascia. The fascia from the lateral lobes of thyroid gland were removed by blunt dissection which exposed the thyroid gland. Position of recurrent laryngeal nerve to inferior thyroid artery on both sides at the base of thyroid gland were observed [1].

OBSERVATIONS

In 21.66% (13/60) specimens the recurrent laryngeal on the right was anterior to the inferior thyroid artery. In 78.33% (47/60) specimens the recurrent laryngeal on the right was posterior to the inferior thyroid artery. In 100% (60) specimens the recurrent laryngeal on the left was posterior to the inferior thyroid artery.

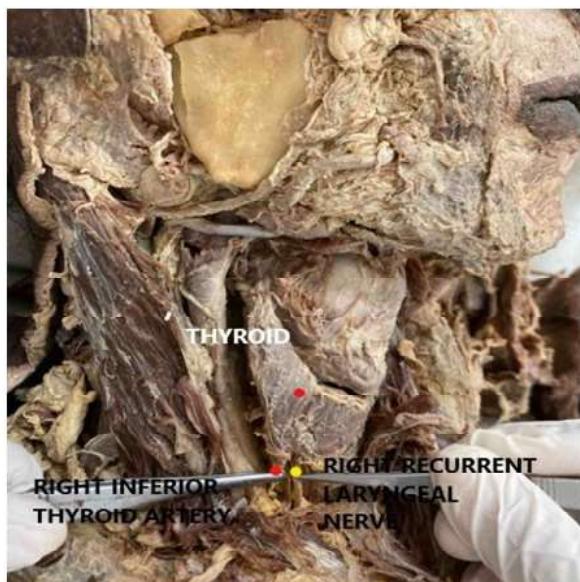


Fig. 1: Right Sided Recurrent Laryngeal Nerve Lying Posterior to Inferior Thyroid Artery.



Fig. 2: Left Sided Recurrent Laryngeal Nerve Lying Posterior to Inferior Thyroid Artery.

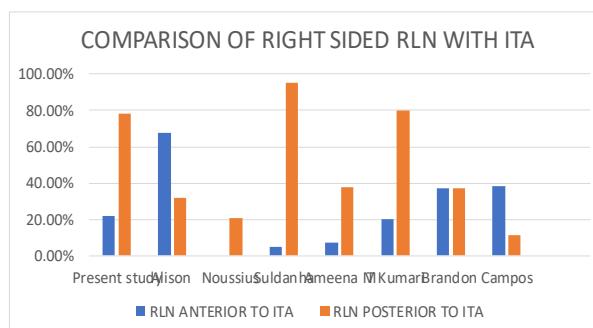


Fig. 3: Comparison Of Present Study With Previous Studies Right Sided Recurrent Laryngeal Nerve With Inferior Thyroid Artery.

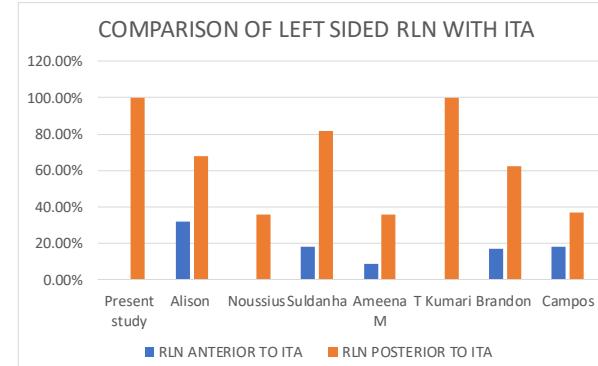


Fig. 4: Comparison Of Present Study With Previous Studies Left Sided Recurrent Laryngeal Nerve With Inferior Thyroid Artery.

Table 1: Relation of inferior thyroid artery to recurrent laryngeal nerve at the base of thyroid gland.

Course of recurrent Laryngeal Nerve	Right sided inferior thyroid artery		Left sided inferior thyroid artery	
	Number	Percentage	Number	Percentage
Anterior/ superficial to ITA	13	21.66%	---	---
Posterior / dorsal to ITA	47	78.33%	60	100%
TOTAL	60	99.99%	60	100%

DISCUSSION

Dissected the neck of 60 cadavers. Relation of inferior thyroid artery to recurrent laryngeal nerve @ base of thyroid gland was studied. On both sides, the inferior thyroid artery originated from the thyrocervical trunk of the subclavian artery. Bilaterally the recurrent laryngeal nerve originated from the vagus. On right side, the nerve hooked the subclavian artery and ascended upward obliquely and reached the base of the right lateral lobe of thyroid gland either posterior (78.33%) to

inferior thyroid artery or anterior (21.66%) to inferior thyroid artery. On left side, the nerve hooked the arch of aorta and ascended upward to base of the left lateral lobe of thyroid gland posterior(100%) to inferior thyroid artery.

In the present study, the most common type of relation between ITA and RLN was, RLN being posterior to ITA on both sides of neck.

Hazem M. Zakaria et al [4] emphasized, that the incidence of injury to recurrent laryngeal

Table 2: Comparison of present study with previous studies – relation of inferior thyroid artery to recurrent laryngeal nerve (right side).

Authors	Right sided RLN anterior to ITA	Right sided RLN posterior to ITA
Present Study (2021)	21.66%	78.33%
Alison M. Thomas et al (2020) [5]	67.90%	32.10%
George Noussios et al (2020) [6]	--	20.78%
Marina Saldanha et al (2019) [7]	5%	95%
Ameena. M et al (2019) [8]	7%	38%
T .Kumari et al (2017) [9]	20%	80%
Brandon Micheal Henry et al (2016) [10]	37.10%	37%
Campos B.A et al (2000) [11]	38.04%	11.26%

Table 3: Comparison of present study with previous studies – relation of inferior thyroid artery to recurrent laryngeal nerve (left side)

Authors	Left sided RLN anterior to ITA	Left sided RLN posterior to ITA
Present Study (2021)	---	100%
Alison M. Thomas et al (2020) [5]	32.10%	67.90%
George Noussios et al (2020) [6]	--	35.73%
Marina Saldanha et al (2019) [7]	18%	82%
Ameena.M et al (2019) [8]	9%	36%
T .Kumari et al (2017) [9]	---	100%
Brandon Micheal Henry et al (2016) [10]	17.20%	62.60%
Campos B.A. et al (2000) [11]	18.05%	37.05%

nerve was high when thyroidectomy was performed for a malignant disease. In an aggressive thyroid cancer, the nerve may be sacrificed purposefully, if it had been encased by the neoplasm [4].

Injury to RLN, is most commonly unilateral and transient, but can also be bilateral and permanent. After surgery, about 12.5% of patients suffer from temporary vocal cord paralysis and 3.8% of patients experience permanent paralysis [4].

Skandalakis et al [12] concluded, that injury to RLN is more common when the nerve lies anterior or in between the ITA. Chiang FY^[13] et al highlighted, meticulous dissection to identify the RLN during operative procedures on thyroid, minimised the risk of RLNI. That it was very beneficial especially on the right side, as it had a predominance of anterior configuration [13].

With recent advances, intra-operatively, there is a preference to use nerve monitoring devices to reduce the incidence of RLN injury. But there are studies suggesting intraoperative nerve monitoring has not proven more effective than direct nerve visualization [4].

Permanent injuries of RLN are best avoided

by identifying, carefully tracing and verifying the anatomic integrity of the path of RLN and also studying to its relation to ITA before clamping the vessel during thyroidectomy procedures at the base of thyroid gland [4].

The purpose of this study was to highlight the variable anatomical relationship of inferior thyroid artery to recurrent laryngeal nerve at the base of thyroid gland. The recurrent laryngeal nerve was predominantly posterior on both sides (R-78.33%, L- 100%) and in 21.66% anterior to ITA on right.

CONCLUSION

Surgical procedures of head and neck, such as radical neck dissection, cricothyroidotomy, conventional thyroidectomy or a minimally invasive options for thyroidectomy, reconstruction of an aneurysm, carotid endarterectomy treatments for cancers of head and neck, diagnostic and therapeutic catheterization of neoplasms of neck may involve inferior thyroid artery [4,14]. In procedures like neck lift or closure of defects of anterior neck, superior thyroid artery (STAP) perforator is commonly preferred as the dominant perforator. Nowadays, inferior thyroid artery (ITAP) perforator flaps are also being tried as

source vessel for cosmetic reconstructive procedures [15].

A detailed knowledge of the relation of inferior thyroid artery to recurrent laryngeal nerve will be of immense use to the surgeon during surgical procedures of head and neck regions. We recommend, the direct visual identification of RLN and to study its relation to ITA which has to be done prior to clamping of ITA as the gold standard to preserve the recurrent laryngeal nerve during operative procedures. Other techniques may be used as an adjunct to the gold standard [16]. The recurrent laryngeal nerve may lie anterior or posterior to the inferior thyroid artery. In the present study the recurrent laryngeal nerve was posterior most commonly on both sides to inferior thyroid artery. On the right, the second common presentation was the recurrent laryngeal nerve lying anterior to inferior thyroid artery.

ABBREVIATION

ITA- Inferior Thyroid Artery,

RLN- Recurrent Laryngeal nerve,

RLNI- Recurrent laryngeal nerve injury,

STAP- superior thyroid artery perforator,

ITAP- inferior thyroid artery perforator.

Author contributions

Nisha S. R. Manuel- The first draft preparation.

B. Anbumalar- Revising of the manuscript

S. Manisha Raaj- Final writeup of the manuscript

Conflicts of Interests: None

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