A STUDY OF RELATION OF RECURRENT LARYNGEAL NERVE TO INFERIOR THYROID ARTERY AND THYROID GLAND

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ABSTRACT

BACKGROUND

The recurrent laryngeal nerve is one of the constant branches of vagus nerve. In this study, our aim is to find out the variations of recurrent laryngeal nerve by dissecting the neck of 25 cadavers.

Aim of the study was to-

1. Find out the recurrent laryngeal nerve which is located in the Tracheo-oesphageal groove or outside the groove on right and left side.
2. Study the branching pattern of the recurrent laryngeal nerve on both sides.
3. Study the relationship of the recurrent laryngeal nerve with the inferior thyroid artery and to the thyroid gland on both sides.

MATERIALS AND METHODS

The present study was conducted by dissecting the neck of 25 cadavers in the department of Anatomy, Government T D Medical College, Alappuzha, Kerala.

RESULTS

The recurrent laryngeal nerve in 88% of cases is seen in the tracheo-oesophageal groove and in 12% of cases, the nerve is seen on lateral surface of trachea. In all the cases, the recurrent laryngeal nerve originated from the vagus. The recurrent laryngeal nerve was in the trachea-oesophageal groove of left side in 22 and outside it in 3 cases.

CONCLUSION

To avoid injury to the recurrent laryngeal nerve in thyroid surgery, a thorough knowledge of position of the nerve and its relationship with the inferior thyroid artery is of great importance.

KEYWORDS

Recurrent Laryngeal Nerve, Inferior Thyroid Artery, Thyroid Gland.

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BACKGROUND

The recurrent laryngeal nerve (nerve of Gallen) is one of the constant branches of vagus nerve. On the right, the nerve arises from the vagus anterior to the first part of subclavian artery, whereas, on the left, it arises from the vagus on the left of arch of aorta. Even though the origin of this nerve differs in right and left side, its cervical course on either side and relation to the neighbouring structures are same. The relationship between recurrent laryngeal nerve and inferior thyroid artery and its importance in thyroid surgery is well known. During thyroid surgery, inferior thyroid artery is ligated away from the gland in order to prevent injury to the recurrent laryngeal nerve because of their close proximity to the inferior pole of the Thyroid gland. A surgeon's knowledge of surgical anatomy and its variations is essential to prevent complications in any thyroid surgery.[1] The variations of the nerve in terms of its course through trachea-oesophageal groove, branching pattern, and relation to the inferior thyroid artery emphasises the identification of recurrent laryngeal nerve before ligating the artery. As the recurrent laryngeal nerve serves the major motor innervations to the intrinsic muscles of larynx and as it monopolise in supplying the posterior cricoarytenoid, the only abductor of vocal fold and the only one responsible for patency of rima glottids and thus the airway there, injury to this nerve unilaterally or bilaterally can cause ill effects like aphonia, stridor, respiratory obstruction, and laryngeal spasm. So the safeguarding of the nerve in every respect is very important in thyroidectomy. For this purpose the surgeon should know about the possible variations of recurrent laryngeal nerve as stated above. In this study, our aim is to find out the variations of recurrent laryngeal nerve by dissecting the neck of 25 cadavers.

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The thyroid gland is intimately related to two important nerves that control the voice-the superior laryngeal nerve and the recurrent laryngeal nerve. The safety of thyroid surgeries mainly depends on complete anatomical knowledge of the arteries and nerves related to it and their anatomical variations.[2] Injury to the recurrent laryngeal nerve during thyroid surgeries can be life threatening even and may change the lifestyle of patients completely.[2] Thyroid surgery requires a thorough knowledge of neck anatomy and its anatomical variations. This is of utmost importance, since it is well known that there are variations of the recurrent laryngeal nerve.[3] The recurrent laryngel nerve crossing the inferior thyroid artery is often considered to be the most vulnerable location when performing a thyroidectomy.[4] The current evaluation of outpatient short stay thyroid surgery and minimally invasive video assisted thyroid lobectomy using laparoscope to avoid scar in the neck requires a very precise knowledge of the normal and variant anatomy.[5] The left recurrent laryngeal nerve is more liable to injury than the right because of its longer course.[6] Importance of recurrent laryngeal nerve is the fact of that it is a nerve which is subjected to much variation in its site, branches and relation with the branches of inferior thyroid artery and to thyroid gland[7]. The recurrent laryngeal nerve palsy can be responsible for major psychological and social difficulties.[4]

Aim of the Study

1. To find out the recurrent laryngeal nerve which is located in the tracheo-oesphageal groove or outside the groove on right and left side.
2. Branching pattern of the recurrent laryngeal nerve on both side.
3. Relationship of the recurrent laryngeal nerve with the inferior thyroid artery and to the thyroid gland on both sides.

Exclusion Criteria- cadavers with injury to the neck were excluded.
Inclusion Criteria- cadavers with intact neck were used.

MATERIALS AND METHODS

The present study was conducted by dissecting the neck of 25 cadavers in the department of Anatomy, Government T D Medical College, Alappuzha, Kerala. Skin was reflected laterally by midline incision from chin to suprasternal notch. Platysma was reflected upwards. Cut and reflected the investing layer of deep fascia was performed. Sternocleidomastoid muscle of both sides were retracted laterally, infrahyoid muscles were identified and cut from thyroid cartilage and hyoid bone and reflected downwards. Thyroid gland was exposed. Position of recurrent laryngeal nerve on both sides were observed.

RESULTS

On left side, the recurrent laryngeal nerve in 88% of cases is seen in the tracheo-oesophageal groove (Figure 5) and in 12% of cases, the nerve is seen on lateral surface of trachea (Figure 6) that is outside the trachea-oesophageal groove on left side. But on right side, the nerve is seen in the trachea-oesophageal groove (Figure 1) in all the cases. Regarding the branching pattern, in 28% of the cases the recurrent laryngeal nerve divides into two to four branches on left side near the thyroid gland (Figure 4), whereas on right side, the same branching pattern is seen in 20% (Figure 5). In 12% the same branching pattern is seen bilaterally (Figure 2). Early branching is seen in 20% on left side (Figure 7).The same is seen on right side in 8% of cases (Figure 3). In this type two branches are seen. The branches of recurrent laryngeal nerve were seen intermingled with the branches of inferior thyroid artery. Rest of the specimens showed no branching, with an incidence of 60% on right side and 40% on left side (Figure 1).

In 20% of cases, the recurrent laryngeal nerve is lying superficial to the inferior thyroid artery on right side (Figure 4). But in all the cases, the nerve is deeper to the inferior thyroid artery on left side.

DISCUSSION

Dissected the neck of 25 cadavers. On both sides in all the specimens, the recurrent laryngeal nerve originated from the vagus. On right side, the nerve hooked around the subclavian artery to reach the neck. Here the nerve has an oblique course by which it ascends upwards and reach posterior to the base of the right lobe of thyroid gland. On left side, the nerve hooked the arch of aorta, then ascend upwards and enter the neck.

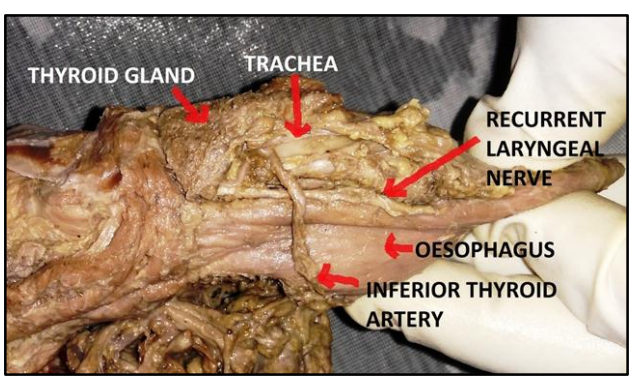

Figure 1. Recurrent Laryngeal Nerve in the trachea-Oesophageal Groove (right side)

Position of Recurrent Laryngeal Nerve	Side and Number		Percentage	
	Right	Left	Right	Left
Within the Tracheo-oesophageal groove	25	22	100	88
Lateral Surface of Trachea	0	3	0	12
Total	**25**	**25**	**100**	**100**

Table 1. Position of Recurrent Laryngeal Nerve in the Neck and its Percentage

According to Sailaja K, the recurrent laryngeal nerve lying lateral to trachea in 60% of cases on right side, and 48% on left side. In her study she revealed that the nerve is ventral to inferior thyroid artery in 40% of cases on right side and 52% on left side. Roshan S et al, in their study

presented that the recurrent laryngeal nerve is lying within the trachea-esophageal groove in 88% of cases on right side and 92% of cases on left side, and the nerve is situated lateral to the groove in 12% of cases on right side and 8% of cases on left side. But in the present study, it is seen that the nerve is in the tracheo-esophageal groove in 100% on right side and 88% on left side and the nerve is on the lateral surface of trachea in 12% of cases on left side only (Table: 1).

The relation of the recurrent laryngeal nerve to the trachea-oesophageal groove- on left side in 22 specimens (88%), the nerve is in the trachea-oesophageal grove. In 3 of the specimens (12%), the nerve is passing through the lateral surface of trachea, which is not in the trachea-oesophageal groove.

On right side, in all the specimens, the nerve is in the trachea-oesophageal groove.

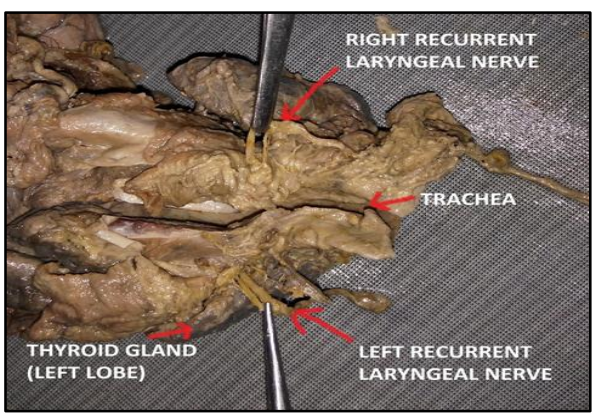

Figure 2. Branching Pattern of Recurrent Laryngeal Nerve Bilaterally (Posterior View)

Pattern of Branching and Number of Branches	Side and Number		Side and Percentage	
	Right	Left	Right	Left
2-4 branches nearer to the gland	5	7	20	28
2 branches early branching	2	5	8	20
Bilateral branching	3	3	12	12
Unbranching	15	10	60	40

Table 2. Recurrent Laryngeal Nerve, its Branching Pattern and Percentage

According to Jacob S. Matubis MD et al, the recurrent laryngeal nerve is branched in 17% of cases on right side and 13% of cases on left side. In the present study, two types of branching patterns are seen, namely branching nearer to the thyroid gland and early branching pattern.

In former, two to four branches are formed under cover of thyroid gland and then entered in to the larynx. This type of branching pattern is seen in 7 (28%) specimens on left side and 5 specimens (20%) on right side. Branching pattern is seen bilaterally in 3 (12%) specimens. In 5 (20%) specimens along left side, an early branching pattern is seen. The same is seen on right side in 2 specimens (8%). Here the nerve branched 2.5 cms below the lower border of the base of the thyroid gland. Two branches are seen in this case. The nerve did not branch in 15 cases (60%) on right side and 10 (40%) cases on left side (Table: 2).

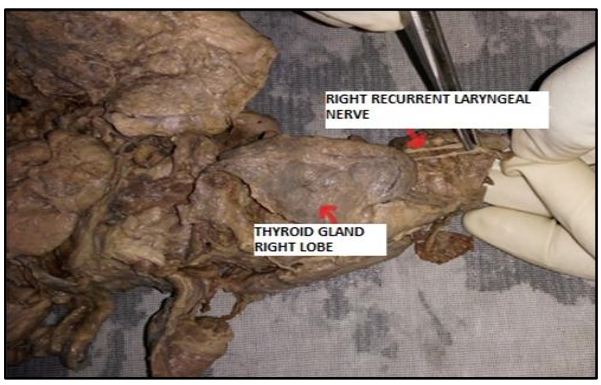

Figure 3. Early Branching Pattern of Recurrent Laryngeal Nerve (Right Side)

In the case where the nerve get branched deep to the gland, the branches of the nerve intermingled with the branches of inferior thyroid artery. In such cases there may be a chance of injury to the nerve when ligating the branches of inferior thyroid artery or when dissecting the deep surface in order to detach the gland.

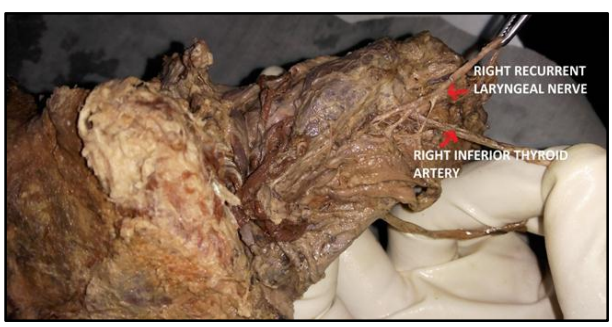

Figure 4. Recurrent Laryngeal Nerve Passing Superficial to the Inferior Thyroid Artery (Right Side)

Relationship of the recurrent laryngeal nerve with the inferior thyroid artery- on right side, 5 (20%) specimens showed the nerve passing superficial to the inferior thyroid artery, then enter into the gap between inferior constrictor muscle. On left side, in all the 25 specimens, the nerve is deeper to the inferior thyroid artery.

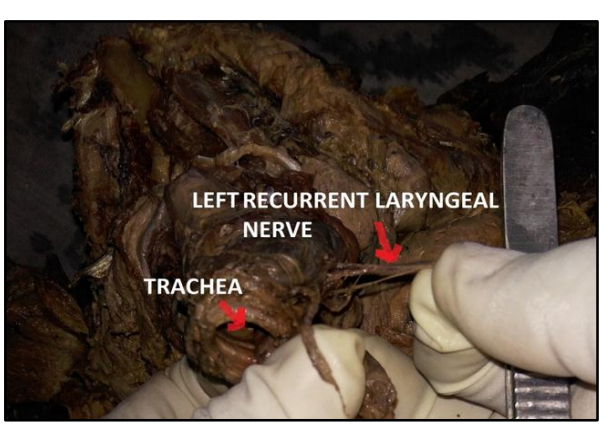

Figure 5. Branching Pattern of Left Recurrent Laryngeal Nerve

Inferior Thyroid Artery	Side and Number		Side and Percentage	
	Right	Left	Right	Left
Superficial to the Artery	5	0	20	0
Deep to the Artery	20	25	80	100

Table 3. Relation of Recurrent Laryngeal Nerve to the Inferior Thyroid Artery and its Percentage

Jacob S. Matubis MD et al, in their study revealed that the recurrent laryngeal nerve is ventral to inferior thyroid artery in 37% of cases on right side and 12% of cases on left side. Sailaja K, in her study said that the nerve is anterior to the artery in 21% of cases and posterior to the artery in 75% of cases. In our study it is seen that the nerve is ventral to the artery in 20% of cases on right side and 0% on left side.

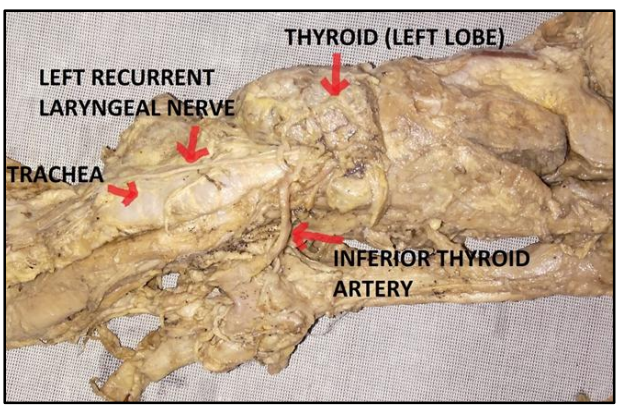

Figure 6. Recurrent Laryngeal Nerve Passing Over the Lateral Surface of Trachea (Left Side)

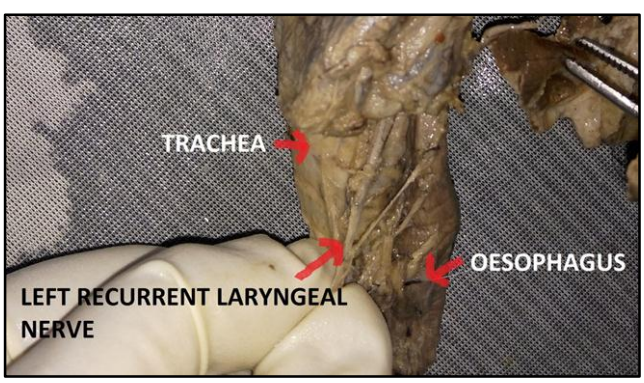

Figure 7. Recurrent Laryngeal Nerve Early Branching

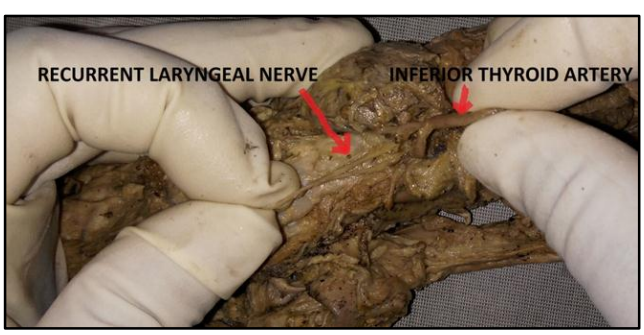

Figure 8. Branches of the Left Recurrent Laryngeal Nerve Passing in between the Branches of the Inferior Thyroid Artery

CONCLUSION

To avoid injury to the recurrent laryngeal nerve in thyroid surgery, a thorough knowledge of position of recurrent laryngeal nerve and its relationship with the inferior thyroid artery and its branches is of great importance. If the recurrent laryngeal nerve is outside the trachea-oesophageal groove, the chance of injury to the recurrent laryngeal nerve is high. The surgeons must be knowledgeable about the neurovascular anatomy of the thyroid gland to prevent surgical complications of the gland.

REFERENCES

[1] Matubis JS, Dumlao KJP, Carrillo FGC. The recurrent laryngeal nerve in relation to the inferior thyroid artery in adult filipino cadavers. Philippine Journal of Otolaryngology- Head and Neck Surgery 2011;26(2):13-17.

[2] Anita T, Dombe D, Dharmendra P. Clinically relevant variations of recurrent laryngeal nerve. IOSR Journal of Dental and Medical Sciences 2014;13(9):59-62.

[3] Idris SA, Ali QM, Hamza AA. Incidence and variations in the relationship between the recurrent laryngeal nerves to the inferior thyroid arteries in Sudanese subjects. Scholars Journal of Applied Medical Sciences 2013;1(5):575-580.

[4] Roshan S, Bhivate VR, Pandey N, et al. Study on recurrent laryngeal nerve: its position and relationship with inferior thyroid artery. International Journal of Anatomy and Research 2017;5(1):3404-3409.

[5] Thilagavathi J, Anandhi V, Seshayyan S. A study on the variations in the relationship between the recurrent laryngeal nerve and the vascular pedicle of the thyroid gland. Int J Anat Res 2016;4(3):2689-2691.

[6] Lalruatkimi K, Thiagarajan B. Recurrent laryngeal nerve: anatomical perspective. J Otolaryngology 2015;5(3):5.

[7] Sailaja K. An observational study on variation in the relations and branches of recurrent laryngeal nerve. Int J Res Med Sci 2016;4(6):2328-2331.