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## **Intralaryngeal Distribution of Laryngeal Nerve Branches**

**Mr. Vijendra Singh**

Research Scholar, Malwanchal University, Indore

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### **Introduction**

The larynx, also known as the voice box, is a complex and essential organ in the human body responsible for speech production, phonation, and protection of the airway during swallowing. The intricate innervation of the larynx plays a crucial role in its function, and the laryngeal nerves are responsible for providing sensory and motor innervation to this organ. One of the fascinating aspects of laryngeal nerve distribution is the intralaryngeal distribution of nerve branches. This intricate network of nerves within the larynx ensures precise control over the vocal cords and sensory feedback during phonation and swallowing. In this comprehensive review, we will explore the anatomy, functions, clinical relevance, and variations in the intralaryngeal distribution of laryngeal nerve branches.

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### **Anatomy of the Laryngeal Nerves**

To understand the intralaryngeal distribution of laryngeal nerve branches, it is essential to first review the anatomy of the primary laryngeal nerves involved: the recurrent laryngeal nerve (RLN) and the superior laryngeal nerve (SLN).

1. Recurrent Laryngeal Nerve (RLN):

- The RLN is a branch of the vagus nerve (cranial nerve X) and has a unique course within the neck.
- On the right side, the RLN branches off the vagus nerve in the neck, loops around the subclavian artery, and ascends to the larynx.
- On the left side, the RLN follows a slightly different path, looping around the aortic arch before ascending to the larynx.
- Once in the larynx, the RLN divides into multiple branches, which play a critical role in controlling the intrinsic muscles of the larynx responsible for vocal cord movement.

2. Superior Laryngeal Nerve (SLN):

- The SLN is another branch of the vagus nerve but has two main branches: the internal branch and the external branch.
- The internal branch provides sensory innervation to the laryngeal mucosa above the vocal cords, including the epiglottis and aryepiglottic folds.
- The external branch provides motor innervation to the cricothyroid muscle, which is responsible for controlling the pitch of the voice by altering the tension of the vocal cords.

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### **Intralaryngeal Distribution of Laryngeal Nerve Branches**

Within the larynx, the RLN and SLN further divide into smaller branches that intricately innervate the various structures of the larynx. Let's explore these intralaryngeal nerve branches in detail.

1. Recurrent Laryngeal Nerve (RLN) Branches:

a. Medial Branch:

- The medial branch of the RLN primarily innervates the posterior cricoarytenoid (PCA) muscle, which is responsible for abducting the vocal cords during inspiration.
- The PCA muscle's contraction is essential for maintaining an open airway during breathing.

b. Lateral Branch:

- The lateral branch of the RLN innervates several intrinsic laryngeal muscles, including the thyroarytenoid (TA), lateral cricoarytenoid (LCA), and interarytenoid muscles.
- The TA muscle controls vocal cord adduction and contributes to vocal fold tension, affecting voice quality.
- The LCA muscle is involved in vocal cord adduction, while the interarytenoid muscles play a role in closing the posterior glottis.

c. Anterior Branch (Nerve to the Cricothyroid Muscle):

- The anterior branch of the RLN is responsible for innervating the cricothyroid (CT) muscle.
- The CT muscle is crucial for adjusting vocal cord tension and pitch modulation during speech.

2. Superior Laryngeal Nerve (SLN) Branches:

a. Internal Branch:

- The internal branch of the SLN provides sensory innervation to the supraglottic larynx, including the epiglottis and aryepiglottic folds.
- This sensory feedback is essential for detecting foreign objects and initiating the cough reflex when needed to protect the airway during swallowing.

b. External Branch:

- The external branch of the SLN innervates the cricothyroid (CT) muscle, which is responsible for controlling vocal cord tension.
- The CT muscle plays a crucial role in pitch modulation and voice production.

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## Functions of Intralaryngeal Nerve Branches

The intralaryngeal distribution of laryngeal nerve branches serves several important functions, including:

1. Vocal Cord Control:

- The medial, lateral, and anterior branches of the RLN, along with the external branch of the SLN, work together to regulate the tension and position of the vocal cords.
- Fine motor control of these muscles allows for precise pitch modulation and sound production during speech.

2. Airway Protection:

- Sensory feedback from the internal branch of the SLN is essential for detecting foreign objects or liquids that may enter the larynx during swallowing.
- This sensory input triggers protective reflexes such as coughing and laryngeal adduction to prevent aspiration into the lower airway.

3. Phonation:

- The coordinated activity of the RLN and SLN branches enables the intricate movements of the vocal cords, facilitating speech and phonation.
- Changes in vocal cord tension and position are responsible for producing different sounds and pitches.

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## Clinical Relevance and Variations

Understanding the intralaryngeal distribution of laryngeal nerve branches is crucial for clinicians, especially during surgical procedures involving the larynx and adjacent structures. Variations and potential injury to these nerves can have significant clinical implications.

1. Surgical Considerations:

- Surgeons performing procedures in the neck, such as thyroidectomy or neck dissections, must be aware of the course and relationships of the RLN, as injury to this nerve can result in vocal cord dysfunction and voice changes.

2. Variations:

- Variations in the course of the RLN can occur, such as non-recurrent laryngeal nerves on the right side or additional branches.
- These variations pose a risk during surgical procedures, as they may be overlooked and inadvertently injured.

3. Voice Disorders:

- Damage or dysfunction of the intralaryngeal nerve branches can lead to voice disorders, including hoarseness, dysphonia, and changes in pitch.
- Neurological conditions affecting laryngeal innervation can also result in voice abnormalities.

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## Conclusion

The intralaryngeal distribution of laryngeal nerve branches is a complex and essential aspect of laryngeal anatomy. The recurrent laryngeal nerve (RLN) and superior laryngeal nerve (SLN) branches play critical roles in vocal cord control, airway protection, and phonation. Understanding their functions, variations, and clinical relevance is crucial for healthcare professionals, particularly those involved in surgical procedures near the larynx. Knowledge of this intricate nerve network allows for better patient care, preservation of voice function, and avoidance of potential complications during surgery.

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## Reference

- a. Sun H, Wu CW, Zhang D, Makay Ö, Zhao Y, Carcofaro P, Kim HY, Dionigi G, Pino A, Caruso E, Pontin A, Pappalardo V. New Paradigms for Neural Monitoring in Thyroid Surgery. *Surg Technol Int*. 2019 May 15;34:79-86.
- b. Cirocchi R, Arezzo A, D'Andrea V, Abraha I, Popivanov GI, Avenia N, Gerardi C, Henry BM, Randolph J, Barczyński M. Intraoperative neuromonitoring versus visual nerve identification for prevention of recurrent laryngeal nerve injury in adults undergoing thyroid surgery. *Cochrane Database Syst Rev*. 2019 Jan 19;1(1):CD012483. [
- c. Bakaliniš E, Makris I, Demesticha T, Tsakotos G, Skandalakis P, Filippou D. Non-Recurrent Laryngeal Nerve and Concurrent Vascular Variants: A Review. *Acta Med Acad*. 2018 Nov;47(2):186-192.
- d. Williamson AJ, Shermetaro C. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Aug 8, 2023. Unilateral Vocal Cord Paralysis.
- e. Espinosa MC, Ongkasuwan J. Recurrent laryngeal nerve reinnervation: is this the standard of care for pediatric unilateral vocal cord paralysis? *Curr Opin Otolaryngol Head Neck Surg*. 2018 Dec;26(6):431-436.
- f. Mahabadi N, Goizueta AA, Bordoni B. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Oct 17, 2022. Anatomy, Thorax, Lung Pleura And Mediastinum.
- g. Daggumati S, Panossian M D H, Sataloff M D D M A F A C S RT. Vocal Fold Paresis: Incidence, and the Relationship between Voice Handicap Index and Laryngeal EMG Findings. *J Voice*. 2019 Nov;33(6):940-944]
- h. Demiryas S, Donmez T, Cekic E. Effect of nerve monitoring on complications of thyroid surgery. *North Clin Istanbul*. 2018;5(1):14-19.
- i. Engeseth MS, Olsen NR, Maeland S, Halvorsen T, Goode A, Røksund OD. Left vocal cord paralysis after patent ductus arteriosus ligation: A systematic review. *Paediatr Respir Rev*. 2018 Jun;27:74-85