



ANATOMICAL VARIATIONS AND BRANCHING PATTERNS OF THE RECURRENT LARYNGEAL NERVE: INSIGHTS FROM ANTERIOR NECK SURGERY STUDIES

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ABSTRACT

A number of recent studies have focused on the anatomical relationships, divisions, and branches of the recurrent laryngeal nerve (RLN) during anterior neck surgery. The association of this artery with the inferior thyroid artery, its penetration into the larynx, and its divisions outside the larynx have been researched specifically. Researchers observed that the RLN divides outside the larynx in a study involving dissection of 44 laryngeal nerves. There are two branches of the superior laryngeal nerve, one of which communicates with the internal branch, while the other penetrates the larynx. There are also three to seven muscles connected to the inferior laryngeal nerve above the cricoid cartilage's lower margin. Muscles included in this category are the anterior and posterior cricoarytenoids, as well as the oblique, transversal, lateral, and lateral cricoarytenoids.

Keywords: Human, Surgery, Laryngeal Nerve, Thyroid

INTRODUCTION

Medical practitioners and surgeons need to understand the anatomy of the recurrent laryngeal nerve [1 - 3]. It is possible to injure the nerves during thyroidectomy or parathyroidectomy procedures performed in the anterior cervical region [4 - 15]. A number of health and behavioral problems can result from injuries such as speech disorders, breathing problems, and swallowing difficulties. Understanding the anatomy of the recurrent laryngeal nerve is increasingly important due to its variability [16 - 19]. The level at which nerve branches divide, as well as their nature and destination, are topics of controversy among scientists and anatomists [20]. Since the clinical picture varies depending on which branch is injured, it is essential to clarify these issues. There is controversy and doubt in the literature despite anatomists and surgeons' awareness of the importance of studying this nerve. As well as aiding in the establishment of techniques for reinnervating the larynx following recurrent laryngeal nerve injuries, a better understanding of the anatomy of the recurrent laryngeal nerve and its terminal branches is also necessary. Among the muscles of the larynx, the recurrent laryngeal nerve has

terminal branches and the aim of this research is to analyze its distribution. There are many controversies regarding the terminal branches of the recurrent laryngeal nerve in the literature, despite its great clinical importance in general; a detailed description of these branches may provide answers to these questions and will be useful in clinical practice.

MATERIAL AND METHODS

This sample was part of a collection of two larynges fixed in 10% formalin from adult individuals of both sexes in the Anatomy Laboratory. Besides the pharynx and tongue, the hyoid bone, muscles around the esophagus, as well as parts of the trachea and esophagus had also been removed. There were 44 recurrent laryngeal nerves dissected from both sides of the nerves. The posterior pharyngeal/esophageal wall was dissected first so that the anterior wall could be exposed and the recurrent laryngeal nerve could be reached. In order to identify the branches inside the muscles and mucosa, the nerve was dissected lengthwise with a magnifying glass with increased the size of the structure by three times.

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Using a digital meter, measurements were made following dissection to determine the relationship between the extralaryngeal division and cricoid cartilage's lower margin, as well as between the intralaryngeal branches and the cricoid cartilage's lateral margins, which are categorized as upper, middle, and lower thirds in this study. We used the chi-square test in the statistical analysis, with a significant value of $P < 0.05$ as the result of correlation between the variables.

RESULTS

An external laryngeal division occurs below or adjacent to the lower margin of the cricoid cartilage (extralaryngeal division). Recurrent laryngeal nerves bifurcate below the lower margin of cricoid cartilage in 62 cases, giving rise to inferior laryngeal nerves and superior laryngeal nerve branches communicating with one another. Between 1 and 10 mm were the distances between the branches below the margin of the cricoid cartilage. The inferior laryngeal nerve extends from the recurrent laryngeal nerve in the other 52 cases when we consider this boundary as the recurrent laryngeal nerve's boundary. The lateral characteristics of the two groups did not differ significantly.

Below the lower margin of the cricoid cartilage, the number of branches of the inferior laryngeal nerve are counted (Intralaryngeal). The inferior laryngeal nerve issues three to seven branches around the larynx, with four to five branches being most common. When the superior laryngeal nerve originated above the lower margin of the cricoid cartilage, the branch that communicates with the internal branch of the superior laryngeal nerve was included in this group.

This area contains the anterior cricoarytenoid muscle. From the trunk of the posterior cricoarytenoid muscle, one or two branches of the inferior laryngeal nerve emerge at the lateral margin of the cricoid cartilage. A comparison of the branches located on the right side and the left side did not show any significant differences. The origin of the lateral branches of the cricoid cartilage was observed in the lower third (45%) or middle third (48%), after dividing the lateral margin into thirds.

An oblique and transversal arytenoid muscle branch was observed in three cases (7%).

Muscles of the transversal and oblique arytenoids. A single branch (91%) or two branches (10%) of the inferior laryngeal nerve innervated the oblique and transversal arytenoids. The cricoid cartilage lamina and posterior cricoarytenoid muscle are the next places they pass between the recurrent laryngeal nerve and the cricoid cartilage lamina. Our research suggests that the lateral margin of the cricoid cartilage is where this branch originates, following the same criteria used to find the origin of the inferior laryngeal nerve. The branch splits into two or three smaller branches after penetrating the muscle.

These branches branch off to the laterally located Cricoarytenoid muscle and the Thyroarytenoid muscle. In the upper third (51%) or middle third (41%) of the lateral margin of the cricoid cartilage, single branches emerged from the inferior laryngeal nerve most often (87%), while two branches emerged from the inferior laryngeal nerve less often (87%). This branch sent several small branches after penetrating the thyroid arytenoid muscle.

DISCUSSION

A split in the recurrent laryngeal nerve between lower margins of the cricoid cartilage (Extralaryngeal Division). Different studies have reported varying occurrences of two and three branches of the recurrent laryngeal nerve before they penetrate the larynx. It has been reported that division absences are common within the lower margin.

It is composed of these branches that makes up the Posterior Cricoarytenoid Muscle. Three types of innervation have been identified in the posterior cricoarytenoid muscle. A single, bifurcated, or trifurcated branch originates from the lower third of the inferior horn of the thyroid cartilage in type I, which occurs in 67% of cases. The superior nerve and the branch from type II, occurring in 27% of cases, could join together to join the arytenoid muscles. The results of our study are therefore confirmed by the results obtained in type III, in which 6.8% had three single branches (5%) or one branch joined to arytenoid muscles (1.7%). Different studies have used different numbers of branches.

Branches originating from the lateral margin of the cricoid cartilage are found in the lower or middle third. The anterior division of the nerve branched into two or three branches that joined the arytenoid muscle branching (range one to three). A reference point was used to show that the first branch originated 3.4 and 4.2 millimeters above the lower margin of the cricoarytenoid junction and that the last branch originated 9.5 millimeters above this point. Our study utilized the upper, middle, and lower lateral margins of the cricoid cartilage as our reference point for branch emission, thereby avoiding measurement errors.

They are all derived from the superior laryngeal nerve, but only two branches (one on each side) originate from the upper recurrent laryngeal nerve. There was a connection between the branches leading to the muscles and the posterior cricoarytenoid muscle. The origin was located behind the cricoarytenoid junction. Two or three branches of the posterior cricoarytenoid muscle moved forward in our study, the oblique and transversal arytenoid muscles. Based on the reference point of the lower margin of the cricoid cartilage, the branches originate at two levels: the upper third and middle third of the lateral margin.

According to this hypothesis, the inferior laryngeal nerve trunk forms a curve toward these muscles.

There were several small branches ending in the branch leading to the thyroarytenoid muscle. In addition, the lateral margin of the cricoid cartilage also displays similar innervation, in which the branch changes direction (forwards) either in the upper or middle third of the cartilage. A branch to the muscle was found approximately above the inferior tubercle in the inferior margin of the thyroid cartilage, with many branches serving to resect the nerve in cases of adductor spasmodic dysphonia. This division was found to be divided into two, three, or several smaller branches. In addition, the superior laryngeal nerve's internal branch could innervate the muscles. Despite finding communication between these two nerves laterally to these muscles, we were not able to confirm such occurrences in the present study. Proprioception rather than motor function was observed in the internal branch. That the branches originating from the recurrent laryngeal nerve comprise the lateral cricoarytenoid muscle, which had three branches. This study reports that only 10 percent of the time did the two branches originate from both muscles, whereas these

authors only described this occurrence in 10 percent of the cases.

CONCLUSION

Finally, very often, the lower margin of the cricoid cartilage is broken below or at the level of the recurrent laryngeal nerve. There are varying numbers of branches that emerge from the inferior laryngeal nerve above the lower margin of the cricoid cartilage. Usually in the lower and middle thirds of the lateral margin of the cricoid cartilage, the inferior laryngeal nerve branches into the posterior cricoarytenoid muscle. On the lateral margin of the cricoid cartilage and the middle and upper thirds of the larynx, the inferior laryngeal nerve issues one branch to the oblique and transversal arytenoid muscles. As far as the lateral margin of the cricoid cartilage is concerned, the inferior laryngeal nerve issues a single branch to the lateral cricoarytenoid and thyroarytenoid muscles. Thus, this study provides clinical assistance through a consistent explanation of the anatomy of the recurrent laryngeal nerve.

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