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AN INVESTIGATION INTO THE INNERVATION OF INTRAMUSCULAR LARYNGEAL MUSCLES

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1. INTRODUCTION

The surgical classification of the external branch of the superior laryngeal nerve, also known as the EbSLN, was introduced by Cernea et al85 in 1992. This nerve was more likely to sustain nerve damage during surgical procedures than any other nerve in the body. A classification that was published in 1998 that was comparable to the Cernea system was done so by Kierner et al86. Friedman et al74 came up with a different classification in 2009 and proposed it. In 2009, Selvan et al87 came up with a new clinical typing of the external branch of the superior laryngeal nerve (EbSLN).

Pulakunta discovered in 2009 that the external branch of the superior laryngeal nerve (EbSLN) pierces the upper pole of the thyroid gland and has one medical branch as well as three lateral branches.

According to Patrica Whitfield's research from 2010, the external branch of the superior laryngeal nerve (EbSLN) has two branches that connect to the cricothyroid muscle8. Devascularizations of the external laryngeal nerve have been linked to dysfunction, according to research published in 2015 by Yalcin B.

The posterior glandular branch of the superior thyroid artery gave rise to the development of the arterial branch that eventually became the external branch of the superior laryngeal nerve (EbSLN).

2. METHODOLOGY

After receiving institutional ethical clearance, the specimens (twenty) were gathered from the Department of Forensic Medicine at Index Medical College as well as from the cadavers (20) in the Anatomy Lab.

The specimens were subjected to micro dissection, and a hand lens was utilised in order to locate the nerve. Twenty samples were taken from the FM department, which was the location of the postmortem examination that took place six hours after the death. Hanging and neck injuries were not considered valid criteria.

En bloc removal was performed on the patient's tongue, larynx, pharynx, upper portion of the trachea, and upper portion of the oesophagus.

After being washed in tap water to remove any blood clots, the specimens were placed in formalin containing 10 percent for a period of 48 hours in order to fix the tissues. After a period of forty-eight hours, they were removed, and a dissection was performed on both sides.

For the purpose of the research, a total of 30 adult human larynx specimens were chosen, 20 of which came from deceased individuals and the remaining 10 from the FM Department. Following the receipt of approval from the relevant institution's ethics committee, a bilateral neck dissection was performed as follows: the cadaver was positioned on the necropsy table in the supine position, and the neck was extended by placing a rolled pad behind the shoulders. A lateral neck incision was performed, but with a slight rotation of the neck to the contralateral side of the body. In all of the cadavers, an incision was made posterior to the pharynx and the oesophagus, superior to the hyoid bone, inferior to the thyroid gland, lateral to the thyroid cartilage, and posterior to the hyoid bone. The incision also included with the specimen the structures of the carotid sheath.

In order to determine the exact course, relations, and terminations of the internal and external branch of the superior laryngeal nerve, as well as to reveal the origin and insertions of the intrinsic muscles of the larynx, bilateral gross dissections were performed on each specimen and then fixed in 10% formalin. These procedures were carried out on each specimen.

Following the careful dissection of the vagus nerve from the jugular foramen to the origin of the superior laryngeal nerve (SLN), which was then followed by the dissection of the internal branch of the superior laryngeal nerve (IbSLN) and the external branch of the superior laryngeal nerve (ExbSLN), the superior laryngeal nerve was located (EbSLN). Both the external branch of the superior laryngeal nerve (EbSLN) and adjacent

structures, such as the superior thyroid artery, as well as the anatomical relationships between the internal branch of the superior laryngeal nerve (IbSLN) and the superior laryngeal artery, were observed and analysed in this study. When it was placed in the tracheoesophageal groove, the recurrent laryngeal nerve (RLN) was located approximately three centimetre divisions above its point of origin. It was determined where the divisions took place and how many extra laryngeal branches there were. It was observed that the recurrent laryngeal nerve (RLN) is connected to the inferior thyroid artery, and this connection was noted. It was necessary to dissect the recurrent laryngeal nerve (RLN) in order to expose the posterior wall of the larynx, which was located behind the cricoid cartilage. It was possible to trace the ramification of the recurrent laryngeal nerve (RLN) all the way up to the level of the lateral cricoarytenoid muscle (LCA), as well as identify the posterior cricoarytenoid (PCA) muscle and the transverse, interarytenoid muscle. Following the dissection of the posterior pharyngeal wall, a magnifying lens was used to access the recurrent laryngeal nerve (RLN) in the opening between the oesophagus and the trachea. The RLN was then dissected, and its branches were identified up until the point where they terminated inside the muscle and the muscosa.

The pattern of anastomosis between the internal branch of the superior laryngeal nerve (IbSLN) and the recurrent laryngeal nerve (RLN) was determined and photographed, as were the communications between the external branch of the superior laryngeal nerve (EbSLN) and the recurrent laryngeal nerve (RLN).

3. RESULTS

Both the superior and recurrent laryngeal nerves supply the intrinsic muscles of the larynx with their innervation. The IbSLN gives three branches after piercing the thyrohyoid membrane in 72 percent of the specimens, and it innervates the interarytenoid muscle in a few of the specimens. The IbSLN is found to be parallel and medial to the superior laryngeal artery in 78 percent of the specimens that were dissected. Loss of the cough reflex is a very real possibility when the internal branch of the superior laryngeal nerve is exposed to the risk of being injured. Because it is the only nerve that travels from the lateral to the medial aspect of the body, it is imperative that the anatomy of the internal branch of the superior laryngeal nerve be studied.

In 61 percent of the dissected specimens, the EbSLN crosses approximately 1 centimetre further above the superior pole of the thyroid gland, and in 72 percent of the specimens, it lies dorsal to the superior thyroid artery. In 37% of the specimens, the EbSLN will split into two branches at the level of the cricoid cartilages, and these branches will innervate the cricothyroid muscle. The most recent research demonstrates that this nerve serves multiple purposes in the voice and in speech. The primary factor in determining the fundamental frequency of the voice is the cricothyroid muscle.

60 percent of the specimens have the RLN located laterally to the trachea on both sides. Additionally, 94 percent of the specimens have the RLN located in close proximity to the thyroid gland, and 39 percent of the dissected specimens have the RLN located posterior to the inferior thyroid artery.

The RLN gives branches in 57% of the specimens before entry into the larynx, and the level of branching occurred 1cm below the point of entry in 72% of the specimens. The level of branching occurred 1cm below the point of entry in both of these percentages. Sixty-nine percent of the specimens that were dissected showed that the majority of the nerve had two branches. The nerve typically divides into two branches that travel to the posterior cricoarytenoid muscle. Additionally, the nerve divides into one branch that travels to each of the lateral cricoarytenoid, interarytenoid, and thyroarytenoid muscles. It is critical for a surgeon to have a comprehensive understanding of this nerve in order to prevent nerve damage during the surgical procedure.

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