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IBN SINA'S VIEWS CONCERNING THE RECURRENT LARYNGEAL NERVE

COMPILED BY M.FARHADI, M.D.

From the Department of Otolaryngology, Iran University of Medical Sciences, Tehran, Islamic Republic of Iran.

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Sheikh Al Rais Abu Ali Husein Ibn Abdullah, Ibn Sina (Avicenna) began the practice of medicine as a teenager.[1] In his comprehensive medical encyclopedia (*Qanoon*= the *Book of Law*) he has described the anatomy of the entire organs of the human body. In the areas of osteology and myology, in particular, he has defined every part in detail, especially in the area concerning the eyes and the muscles of the eye ball. His elaborations correspond with modern views.

During Ibn Sina's millenium, in 1954, it was asserted that Ibn Sina has enriched the knowledge of dissection and that in this field, as in other sciences, he has had a clear cut objective. Ibn Sina defines the development of the limbs and organs in connection with their functional aspect. It was Ibn Sina who for the first time made mention of the trigeminal nerve in his book, the *Law*. This indicates that Ibn Sina undertook dissection inspite of the religious limitation then prevailing.[2]

Some textbooks give the name of Wasal[3] as the father of anatomy. However, in view of the historical documents, particularly with reference to the *Book of Law*, we realize that Wasal and other famous masters of anatomy and dissection of the West have extracted their basic knowledge and information from the *Book of Law*, which was taught in European medical schools for over five hundred years.

In order to draw attention to the pre- eminence of our national Islamic civilization and culture, we undertake, below, a review of the recurrent laryngeal nerve as seen by Ibn Sina in comparison with the views of modern scientists.

The laryngeal recurrent nerve is a branch of the vagus or pneumogastric nerve. In his *Book of Law*, Abu Ali Sina has described the vagus nerve and its extensive ramifications in supplying nerves to the heart, the lungs, the respiratory tract, the digestive system and even the ears. However, we will focus only on the recurrent laryngeal nerve for our dicussion.

Galen and Abu Ali Sina have both stated that there are nine pairs of cranial nerves, according to the number of foramena in the base of the skull through which they emerge. This method of classification had been in use until the end of the 19th century A.D. (*Anatomy*, by Englishman Thomas Willis, 1664). However, toward the end of the 19th century, Semmering asserted 12 pairs of nerves for the cranium, based on their apparent emergence from the brain, and this is the criterion in use today. In other words, Ibn Sina has considered the 7th and the 8th pair of nerves (facial and cochleovestibular nerves) as one pair; also, he regarded the 9th, 10th and 11th nerves (glossopharyngeal, accessory and vagus nerves) as one because these nerves emerged from a single orifice in the skull.

Nevertheless such classifications are stipulative and selective and have no unfavorable bearing on the essential topic, which is careful anatomy and dissection of neural branches and their relation with bodily organs and their functions.

It is not an easy task to locate the recurrent laryngeal nerve in the dissection of the anterior section of the neck. If dissection is not done meticulously, the laryngeal recurrent nerve will either not be located at all or the nerve itself or its branches maybe damaged in the process.[4]

An ancient Iranian physician known as Ibn Al-Nafis is the author of a book titled *Al Mujazal Qanoon.*[5] As quoted by Qureshi in his account, the said book describes the recurrent laryngeal nerve as follows:

"The nerve then extends upward in the direction from which it came until it reaches the larynx. The reason the nerves does not take a short cut to the larynx is that up to this point there is no organ on which the nerve (recurrent laryngeal) can recline. For an organ to be used as support for this nerve, it must be sturdy and

soft and be located within an appreciable distance from the larynx or be oblique to the extent that the nerve can recline on it and twist around it before it reaches the heart. The farther the nerve from the brain the harder it becomes. It must be known that on its descending track the nerve meets with vessels and arteries, some of which are straight, others are oblique but none is sturdy enough to be used as support by this nerve. On its upward course the recurrent laryngeal nerve twists around an object which is perpendicular and straight. Similarly, an oblique object does not provide adequate support, for such support is weak and diminishing. Thus, for reasons explained, the left recurrent laryngeal nerve reclines on the large pulsating vessel that leaves the heart and goes to the spinal column. This blood vessel has all the aforesaid characteristics including strength, and softness. The nerve adheres to the base of the vessel, twists around it, then parts with it and goes to the trachea so as to remain safe by reclining on it. But the right recurrent laryngeal nerve twists around the blood vessel that proceeds from the right arm- pit, but as it lacks the reclining conditions of the other vessel, here, Almighty God has deposited greater strength and security in the relative nerve in the following manner :

1- The nerve in question first touches, then mounts it and twists around it, finding greater strength. It then extends to the right side of the trachea and imparts a membranous wrap to it.
2- From either side of the nerve in question, branches shoot off to adjacent limbs for there exist limbs on the right side of the thorax that must be fed by this nerve. As tree roots, these branches help strengthen this nerve.
3- In addition to above protective measures, Almighty God has further strengthened the above-mentioned nerve with mighty tendons and has attached it to adjacent limbs by means of membranous tendons.
4- When this nerve enters the larynx, it merges with its first part that had already entered therein and the entire nerve acquires greater strength by this union, for a combination of two weaker objects yield a sturdier object.

In view of the foregoing arguments, we may then say that the aforesaid two nerves conjoin at the lower angles of the cricoid cartilage whence they enter the larynx and then divide within the space between the two muscles that are present there and therefrom branch off to the posterior cricoarytenoid, and to the oblique arytenoid muscles another nervous offshoot goes to the muscles that surrounds the base of the third cartilage. And, thus, if the two recurrent nerves are severed, lacerated, tied or depressed by fingers, the animal becomes totally mute.* Galen says "having learned these secrets, it is incumbent on any wise man to glorify the Lord as much as he can."[6]

Commentary

This elaborate description of the recurrent nerve is to signify why this nerve journeys such a relatively long course to the larynx, wherease it could branch off the vagus nerve at a point more superior and reach its destination. Such divine expediency and wisdom is traceable in the details of the anatomy of the human body in ancient textbooks.

In comparing Ibn Sina's views with modern views as indicated in reliable texts on the anatomy and surgery of the neck we read:

"The right recurrent laryngel nerve parts with the vagus nerve at the base of the neck, circles the subclavian artery, passes under it and moves upward in the direction of the larynx. The left recurrent nerve separates from the vagus nerve at the aortic arch and, from under and behind the aortic arch in a lateral relation to the obliterated ductus arteriosus, goes upward. Both nerves pass the posterior carotid sheath. The main body of the recurrent laryngeal nerve, after separating from the vagus nerve at the upper aperture of the thorax, settles in a triangle bound by the common carotid artery, the internal jugular vein and the vagus nerve (outwardly) and by the trachea and esophagus (inwardly). It then passes under the esophagus shield, under the trachea, the superficial and profunda and sometimes through branches of the lower thyroid artery, passes through the mucosa of the throat and larynx to all laryngeal muscles except the cricothyroid muscle, and provides a sensory branch to the mucus membrane under the vocal cords and then joins up with the upper laryngeal nerve to form the ansa cervicalis (ansa Galenci).

The distance of the recurrent nerve from the trachea and esophagus is different on both sides of the body and uneven in all human beings.

In his interpretation of Ibn Sina's book *the Qanoon*, Quraishi writes :

"The left recurrent nerve rests on the aorta, the large pulsating blood vessel that emerges from the heart and extends toward the spinal cord; the said nerve twists around the base of the aorta, then separates from it and reclines on the trachea (lodges in the trachea and esophagus duct) and then ends up in the larynx".[7]

In the books on anatomy and surgery it is stated that the recurrent laryngeal nerve imparts branches to laryngeal muscles from a point beside the cricothyroid duct and it has been established that in 39% of the cases the recurrent nerve divides into anterior and exterior branches at a point outside the larynx (Katz and

* Note: Today it is clear that even complete bilateral severance of the recurrent laryngeal nerve does not cause muteness. This discrepancy is most probably due to lack of correlation between physiology and anatomy at that time. Ibn Sina was concerned mostly with anatomy of the recurrent laryngeal nerve.

emiroff) in such a way that the exterior branch is likely the abductor and the anterior branch the adductor. The recognition of these neural branches is important in forestalling damage to a couple of other nerve branches.

In Quraishi's account we noted that the nerves in question enter the larynx alongside the lower angles of the cricoid cartilage and divide into terminal branches.

In his descriptive anatomy, Testo states that the terminal fibers of the recurrent nerve comprise five nerve offshoots, of which one is anastomotic, that is, by joining a nervous fiber of the superior laryngeal nerve form the ansa Galenci and the other four nerve offshoots terminate in all laryngeal muscles save the cricothyroid muscle.

In Ibn Sina's book *Qanoon*, too, these same five nerve fibers are described as Quraishi in his interpretation of the said book has written:

"When the recurrent nerve enters the larynx, it merges with the first part that had already entered it".[9]

By the «first part» is meant the superior laryngeal nerve which is itself an offshoot of the vagus nerve. And by «merge» is meant anastomosis and since Galen was the first to mention this «merger», therefore the nerve in question was named after him.

With respect to the other four nerve fibers, we quote one of Ibn Sina's remarks below:

"The first thing is that two offshoots grow up from them that enter the mutbaqah muscles of the larynx". These are thyro-arytenoid and the crico-arytenoid lateral muscles. The term «mutbaqah» means «blocker» because these muscles push the vocal cords together, shutting off the larynx. This is the adduction stage. Ibn Sina then continues:

"Another nerve branch ends in the «fataha» (or opener) muscle of the larynx".By this is meant the crico- arytenoid posterior muscle, which performs the opening or abduction function.

"And another nerve branchlet goes to the muscle that surrounds the third cartilage". By third cartilage is meant the arytenoid cartilage and the muscle that surrounds this cartilage is the inter-arytenoid muscle.

The foregoing account is positive proof that ancient physicians generally and Ibn Sina in particular had known the recurrent laryngeal nerve in all aspects, including its roots, course and terminus and their words agree with that which modern text books reveal today.

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