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Research Article

Coordinated Action of Soft Palate and the Pavilion of the Auditory Tuba in the Defense and Phisiology of the Middle Ear

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Abstract

Introduction: The participation of the soft palate in swallowing, breathing and phonation in joint action with the oropharyngolaryngeal muscles is known.

Method, objectives. This article substantiates the hypothesis of the coordinated participation of the soft palate and the pharyngeal pavilion of the auditory tube in the protection and auditory physiology of the middle ear.

Discussion. Conclusions: The peristaphyline muscles external, internal and the pharyngostaphyline share insertion with the velum and the membranous portion of the tubal concha. The contraction of these muscles, the levator veli initially, controlled by the X cranial nerve. immediately followed by the contraction of the velial tensor, innervated by the trigeminal nerve, they raise the velum, block the pavilion (second protection gate), trap air and open the entrance orifice to the duct (closed at rest, first protection gate), the air is propelled into the interior of the tube, whose speed increases even more due to the Venturi effect and the attraction exerted by the negative pressure of the rarefied air of the box, which allows, with great ease and little expenditure of energy, to equalize intra- and extra-tympanic pressures favoring the mobility of the tympanic membrane and the chain of ossicles, promoting the conduction of the sound wave for adequate hearing. (Auditory function).

The entrance hole to the duct located at the bottom of the tubal pavilion is protected by this cartilaginous framework from the influence of external regional factors or those coming from outside.

Keywords: middle ear; soft palate; peristaphyline muscles; auditory tuba; venturi effect

Introduction

Nature is perfect in all its extension. Since the emergence of life, its development is marked by the constant evolution experienced by the species that, through constitutional and functional changes, have allowed it to adapt to the environment and its changes in order to ensure subsistence or survival.

In man, from his conception, the formation and development of all his morphological and functional characters begins, a process marked by perfection at each stage. Evolution is so complex and the result so perfect that despite being the most studied species, not only are we still far from knowing everything related to it, but sometimes an erroneous interpretation has been given to some element that a posteriori has been corrected or remains unclear. Currently, a large number of scientific studies seek to find new explanations and solutions to get closer and closer to the full knowledge of the human species. This is the main objective of this article.

It is difficult to accept that the security mechanism created by nature to defend the entrance of the conduit that leads to the thickness of the container that houses structures of great importance for the stability and maintenance of life, can be so easily violated by multiple factors considered harmful to that anatomical structure. We refer to the entrance hole to the Eustachian tube duct that joins the nasopharynx with the middle ear located in the thickness of the rock that also houses the inner ear and important vessels and nerves. The safety mechanism that controls the entrance to the conduit has been judged incompetent by stating that factors such as the deviation of the nasal septum, local and regional secretions, inflammation and hypertrophy of the adenoid masses, gastric regurgitation, etc. they can easily break it [1,2,3,4,5,6,7,8,9,10].

In order to understand the efficiency of the defense mechanism created by nature to guarantee the functioning of the structures contained in the rock in "all" the stages of individual development, this article invokes and integrates anatomical and physiological aspects of said region that can contribute to a better understanding of its effectiveness.

The oral-pharyngeal-laryngeal region includes a large number of muscles and cranial nerves that work with amazing coordination and apparent ease to

participate in the functions of swallowing, breathing, and phonation. The soft palate is an active part of this anatomical region [11,12,13,14,15].

The soft palate is made up of 5 muscles on each side. The azygos of the uvula or palato-staphylino; the palato-glossus or glosso-staphylin which forms the anterior pillar; the pharyngo-staphyline or palato-pharyngeal, known as the posterior pillar; the external or tensor peristaph and the internal or levator of the velum. The motor innervation of the velum muscles is carried out by the accessory branch of the pneumogastric with the exception of the tensor muscle which is innervated by the mandibular branch of the trigeminal. The participation of the peristaphyll, external and internal muscles, and the pharyngostaphylin in the dilation of the entrance orifice to the pharyngeal tube to allow the passage of air to the middle ear is known. [11,12,13,14,15].

The internal peristaphyllum muscle or levator veli, called petro-salpingo-staphylinus by its insertions, originates from the base of the skull at the level of the postero-medial aspect of the petrous bone. It is inserted into the edge of the postero-internal part of the cartilago-membranous portion of the pharyngeal orifice of the tube and descends to the palatine aponeurosis. [11,12,13,14,15,16,17,18,19,20].

The external peristaphyll muscle, tensor veli, or spheno-salpingo-staphyllum muscle originates from the base of the medial pterygoid plate of the sphenoid and from the anterolateral cartilago-membranous portion of the pharyngeal labrum of the tube. It descends to the hook of the pterygoid process, heading at a right angle in the shape of a fan until it inserts into the anterior and middle part of the palatine aponeurosis. [11,12,13,14,15,16,17,18,19,20].

The pharyngo-staphyline or palato-pharyngeal muscle originates from 3 fascicles: palatine: tubal and pterygoid. The tubal fold contributes to dilate the tube orifice [11,12,13,14,15,16,17].

The tuba pavilion located on the lateral wall of the nasopharynx is made up of a cartilage-membranous skeleton. The cartilaginous component protrudes from the pharyngeal lateral wall at its anterior, superior, and posterior borders, projecting downward, inward, and forward. The lower ends are continuous with the membranous component, one from the anterior and the other from the posterior. [11,12,13,14,15,21,22,23].

Method:

This article bases the author's hypothesis that exposes the anatomical-physiological mechanisms created by nature with the aim of helping to clarify the contradictions related to criteria collected in the specialized scientific literature that consider the entrance to the middle ear, controlled by the soft palate, the pharyngeal pavilion of the Eustachian tube and the tubal orifice, vulnerable to transit and the influence of various noxas that alter the health of that anatomical structure. To reinforce the statements derived from the analysis and, at the same time, avoid plagiarism, reviews of multiple bibliographic references and specialized texts were carried out.

Development and discussion

The soft palate and the pharyngeal pavilion of the Eustachian tube, apparently independent structures, act in coordination in the protection and physiology of the middle ear.

The contraction of the internal peristaphyline muscle raises the velum and places it in front of the tubal pavilion (protective function). At the same time, the contraction and elevation of the posterior membranous segment occurs, contributing to the hermetic closure of the infundibular vessel created (truncated cone) where a small volume of air is trapped. The tensor muscle immediately contracts, causing a slight collapse of the velum that acts as an embolus to project the trapped air into the duct, facilitated by the contraction of the tensor muscle fascicle that pulls the anterior membranous portion, opening the pharyngeal orifice of the tube. As this air passes through the progressive narrowing of the duct, it increases its speed until it exceeds the isthmus where a negative pressure is generated (Venturi Venturi) [23,24,25,26,27] to which is added the attraction exerted by the thinning of the intratympanic air, It is very easy to overcome the natural resistance offered by the duct in its transit to the tympanic cavity to equalize the pressures, restore the mobility of the tympanic membrane and the chain of ossicles, allowing the efficient conduction of sound. (Auditory Function).

The morphological and functional characteristics of the pharyngeal pavilion make it the guardian of the entrance hole of the duct from the influence of factors considered “harmful agents” for the functioning and health of the intratympanic structures.

The concha, made up of a cartilaginous framework, a continuation of the auditory tube, protrudes from the lateral wall of the pharynx on its posterior, superior and anterior edges, projecting its exit downwards, forwards and inwards, placing it slightly inclined in relation to the choanae. The spatial arrangement of its entrance avoids the direct impact of materials coming from the nasal passages, which descend towards the hypopharynx through the grooved space between both structures. At the bottom of the pavilion is the entrance hole of the conduit, duly protected by the aforementioned. This hole remains closed at rest (first gate), and can only be crossed inwards when it is opened to allow the passage of air, a moment that is protected by the veil (second gate), and towards the outside, by movement. ciliary that transports secretions from the middle ear and adjacent cavities.

When the soft palate rises to position itself in front of the rim of the tubal pavilion, it has the ability to clear that area by displacing any element that might be located in front of it.

Conclusions

-The elevation and tension of the soft palate and the opening of the orifice of the duct, caused by the contraction of the internal and external peristaphyline muscles and the pharyngostaphyline, block the pharyngeal pavilion of the tube, dilate the entry orifice and project air towards the interior of the tympanic cavity allowing the protection and proper function of the structures of the middle ear.

-The soft palate, in addition to intervening in swallowing, breathing and phonation, performs a protective function of the middle ear and auditory function.

-The constitution and shape of the pharyngeal pavilion of the auditory tube protects the entrance hole to the canal, located at the bottom of it, from foreign elements.

-“Considering that the security mechanism of the entrance hole to the middle ear, created by nature to protect vitally important structures, is incompetent and easily violated by multiple factors (deviations of the nasal septum, sinusopathies and adenoid hypertrophies among others), it is “an error of evaluation of the perfection achieved by the evolution of the species, present in all stages of the development of the individual.”

-The surgical elimination of the factors considered predisposing as a measure to avoid middle ear conditions, their evolution and complications, is unnecessary because it is ineffective and potentially harmful.

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