Review
article

Palatoglossus muscle neuroanatomy - a review

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Abstract

The palatoglossus muscle is classically described as an extrinsic muscle of the tongue. However, this description is not consensus among the researchers, is one that sometimes it is not considered a muscle of the tongue. Thus, the objective of this study is to discuss some neuroanatomical aspects of palatoglossus muscle that may help explain this aspect. Furthermore, this study shall be useful for clinicians, surgeons and academics that manipulate and keep particular interest for this anatomical site.

Keywords: tongue, tongue innervation, palatoglossus muscle, neuroanatomy.

1 Introduction

1.1 Tongue

The tongue, partially located in the oral cavity and the oropharynx, is a muscular organ that can assume various shapes and positions. Classically, it is known that tongue is composed of extrinsic (genioglossus, styloglossus, hyoglossus and palatoglossus) and intrinsic (superior and inferior longitudinal, transverse, and vertical) muscles (MOORE, DALLEY and AGUR, 2011; WILLIANS, 1995).

1.2 Clinical implications

The roles played by the tongue in speech, swallowing, and respiration have been demonstrated in both humans and animals. Tongue dysfunctions could lead to dysarthria, dysphagia and obstructive sleep apnea. Thus, advances in the treatment of these disorders require a greater understanding of tongue biomechanics. However, little is known about how each of the tongue muscles contributes to these motor tasks (MU and SANDERS, 2010).

In addition, there is no unanimity among several authors (TOURÉ and VACHER, 2006; ALVES, 2010) to classify the palatoglossus muscle as part of the tongue. Likewise, there are controversies regarding its innervation (WILLIANS, 1995; MADEIRA, 1997; PUTZ and PABST, 2000). Therefore, the purpose of this review is to discuss some anatomical and functional implications of the tongue muscle that may help explain this aspect, particularly with relevance to neuroanatomy of the palatoglossus muscle.

2 Material and methods

For the preparation of this paper were consulted scientific articles published in English and textbooks. The articles were accessed from a basic search in *PubMed* database (http://www.ncbi.nlm.nih.gov/pubmed), using terms like "tongue", "tongue muscles", "palatoglossus", "tongue innervation" and "hypoglossal nerve".

3 Results

3.1 Anatomical and functional aspects of palatoglossus muscle

The tongue is, in essence, a mass of muscles mainly covered by mucosa. Although traditional descriptions of the actions of the tongue muscles that attach to a single action or a specific muscle indicate that a particular movement is a consequence of the action of a single muscle oversimplify the actions of the tongue and are misleading. Thus, the tongue muscles do not function in isolation and some muscles perform multiple actions. It is generally accepted that activation of the intrinsic tongue muscles alters the tongue shape, whereas activation of the extrinsic tongue muscles is associated with the position and movement of the tongue (WILLIANS, 1995; MOORE, DALLEY and AGUR, 2011; MARTINI, 2009).

Similarly, it is known that four nerves supply innervation to the tongue. The hypoglossal nerve supplies motor innervations to all tongue muscles. The lingual nerve, a branch of the mandibular division of the trigeminal nerve, provides both gustatory and general sensory fibers to the tongue. The gustatory component is contributed by the chorda tympani branch of the facial nerve which connects with the lingual nerve. Finally, the glossopharyngeal nerve terminates in the mucosa and the vallate papillae at the posterior third of the tongue to supply general sensation and taste (MU and SANDERS, 1999).

Recent studies (HIIEMAE and PALMER, 2003; TOURÉ and VACHER, 2006) described in detail the

functional importance of palatoglossus muscle in the complex movements of the tongue. Moreover, there are numerous studies (MOORE, DALLEY and AGUR, 2011; WILLIANS, 1995; MARGARET and HERRING, 1998; MARTINI, 2009; GARDNER, GRAY and O'RAHILLY, 1988) describing the anatomical palatoglossus muscleconnection with the tongue, it becomes unquestionable anatomical and functional organization of the palatoglossus muscle with the tongue. On the other hand, other authors (ABD-EL-MALEK, 1939; O'REILLY and FITZGERALD, 1990; ALVES, 2010; MU and SANDERS, 1999) do not have described the palatoglossus muscle as a tongue muscle.

To our knowledge, this controversy is due to the fact that some authors (MARGARET and HERRING, 1998; MARTINI, 2009) have considered the palatoglossus muscle as a muscle belonging to the palate. According to Madeira (1997), the palatoglossus muscle actually originates from the lower surface of the palatal aponeurosis. For insertion, several authors (MADEIRA, 1997; MOORE, DALLEY and AGUR, 2011; WILLIANS, 1995; MARTINI, 2009; GARDNER, GRAY and O'RAHILLY, 1988; HIIEMAE and PALMER, 2003; TOURÉ and VACHER, 2006) agree that their insert is in the posterolateral region of the tongue and thus it was directly associated with the tongue. Similarly, previous studies (LANGDON, KLUEBER and BARNWELL, 1979) have reported that within the root of the tongue, some fibers of palatoglossus muscle combine in a longitudinal muscular complex to course anteriorly toward the tip, others appear to join the transverse muscular system.

Another important aspect is the controversy about the innervation of the palatoglossus muscle. Nonspecific descriptions (CARNEIRO, 2004; MACHADO, 1998) have considered that all the tongue muscles are innervated by the hypoglossal nerve. On the other hand, other authors (BURT, 1995; MARTINI, 2009; MOORE, DALLEY and AGUR, 2011; WILLIANS, 1995) have shown that the whole intrinsic and extrinsic musculature of the tongue is supplied by the hypoglossal nerve, except the palatoglossus muscle that is supplied by the vagus nerve.

According to Madeira (1997) and Putz and Pabst (2000), palatoglossus muscle receives innervation from the glossopharyngeal nerve. In relation to the glossopharyngeal nerve, several authors (SNELL, 2011; BURT, 1995; MOORE, DALLEY and AGUR, 2011; WILLIANS, 1995) have argued that this nerve is solely responsible for stylopharyngeus muscle innervation and thus not the glossopharyngeal nerve would be responsible for palatoglossus muscle innervation.

Therefore, from numerous studies in this report we can conclude that palatoglossus muscle innervation is by the vagus nerve, and not by the hypoglossal nerve or glossopharyngeal nerve. Likewise, we also find that this controversy can to induce the do not citation of palatoglossus muscle as integrant part of the extrinsic muscles of the tongue.

To our knowledge, this simple review may explain important neuroanatomical aspects of the palatoglossus muscle, may also help to clarify many controversies about the anatomical organization of an important muscle of the palate and tongue.

4 Conclusion

We undertook this study with the aim of providing a more accurate report about the palatoglossus muscle neuroanatomy, because of this interesting relationship with the tongue and palate. Finally, this study shall be useful for clinicians, surgeons and academics that manipulate and keep particular interest for this anatomical site.

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