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# Topographic study of the sphenomandibular muscle

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## ABSTRACT

The temporal muscle is housed in the fossa of the bone bearing its name – the temporal bone. Its origin, body, and insertion have been well studied, and it has been described as a muscle consisting of three bundles and responsible for various functions. The advancement of technology has allowed the observation of yet another muscle next to this bundle of fibers and above the temporal muscle, namely the sphenomandibular muscle. The present study was designed to study the topography of the sphenomandibular muscle. Ten anatomical sets (five cadavers) were dissected with the intention of displaying the topography of the temporal and sphenomandibular muscles using the techniques of cutting and folding and conventional cross cuts. The folding of the structures and mapping of the muscles was carried out on four cadavers, analyzing their origins and describing their bodies and insertions. On another cadaver, cross-sectional (horizontal), 2 mm-thick slices were made in a sequential manner. We observed the topography of the muscle and its relationship with adjacent structures. The sphenomandibular muscle was found to be independent of the temporal muscle, for its origin is in the zygomatic-frontal complex, lateral to the orbit and overlaying the fiber of the anterior bundle of the temporal muscle. Its body is separated from the body of the temporal muscle by a thin fascia and is inserted on an oblique line external to the mandible presenting, therefore, its origin, body, and insertion independent of the origin, body, and insertion of the temporal muscle.

**Keywords:** Sphenomandibular muscle, temporal muscle, ocular pain.

## Estudo da topografia do músculo esfenomandibular

## RESUMO

O músculo temporal fica alojado na fossa temporal do osso de mesmo nome. Sua origem, corpo e inserção são bem estudados, e ele tem sido descrito como um músculo constituído por três feixes e responsável por várias funções. O avanço da tecnologia permitiu a constatação da existência de outro músculo junto ao feixe anterior do músculo temporal, a saber, o músculo esfenomandibular. O presente trabalho, que teve por objetivo estudar a topografia dos músculos esfenomandibulares em 10 peças anatômicas (cinco cadáveres) humanas. Os cadáveres foram dissecados buscando evidenciar a topografia dos músculos temporal e esfenomandibular, através das técnicas de rebatimento ou convencional em quatro cadáveres e de cortes transversais, em um. Em oito peças foi realizado rebatimento das estruturas e mapeamento dos músculos,

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analisando-se sua origem, descrevendo-se o seu corpo e suas inserções. Em outro espécime foram feitos cortes transversais (horizontais), em fatias de 2 mm de espessura, peças estas que foram estudadas de forma sequencial, do primeiro corte até o último. Observou-se a topografia e a relação com estruturas contíguas. Verificou-se que o músculo esfenomandibular é uma entidade muscular independente do músculo temporal, pois apresenta origem no complexo zigomático-frontal, lateral da órbita e sobrepondo às fibras do feixe anterior do músculo temporal. Seu corpo apresenta separado do corpo do músculo temporal por uma fina fáscia e inserção na borda anterior do processo coronoide (linha oblíqua externa da mandíbula), apresenta portando, origem, corpo e inserção independente da origem, corpo e inserção do músculo temporal.

**Palavras-chave:** Músculo esfenomandibular; músculo temporal; dor ocular.

## INTRODUCTION

The temporal muscle, lodged in the temporal fossa, has been described as a muscle consisting of three bundles and accounting for multiple functions. However, the advancement of technology has allowed the identification of yet another muscle near the anterior bundle of the temporal muscle, as described by Dunn et al. (1), namely the sphenomandibular muscle. Contrary to earlier perceptions that regarded this entity as forming part of the anterior temporal bundle (2,3) (as it was first described), it was found to consist of fibers originating anterior to those of the temporal muscle – an anatomically independent muscle with interrelated and specific functions.

This finding has great significance, since this is a muscle with considerable volume, important functions, and it connects the mandible to the bone that comprises the orbit (1).

Shankland (4), studying craniofacial pain syndromes resulting from temporomandibular disorders, noted the presence of a muscle-like structure in the anterior portion of the origin of the temporal muscle. This structure appeared to originate in the medial face of the zygomatic process with its insertion in the coronoid process. This structure was thought to be an accessory of the temporal muscle, and there were indications that it might have some influence on temporomandibular disorders.

In 1987, Weiner (5) studied the relationship between temporomandibular disorders and the ophthalmic vessels. Weiner indicated that changes in the blood flow of the veins around the eyes were related to a dysfunction of the stomatognathic system.

More than the importance of this new anatomical description, the finding emphasizes the significant possibility that this muscle might be related to temporomandibular disorders. Thus, the present research was designed to study the topography of the sphenomandibular muscle.

## METHODOLOGY

This descriptive study was approved by the local Research Ethics Committee (Process #140/03 of 8/15/2008).

Five human cadavers (ten anatomical sets) were dissected in the Department of Anatomy at the Pontifical Catholic University of Goiás for the purpose of revealing the topography of the temporal and sphenomandibular muscle. Studies were conducted by the use of both reflection and conventional techniques (Figures 1 and 2), as well as transverse sectional slicing (Figures 3 and 4).



FIGURE 1 – Conventional dissection of the sphenomandibular muscle: temporal muscle (TM) and sphenomandibular muscle (SM).



FIGURE 2 – Reflection of the sphenomandibular muscle showing separation by a fascia.



FIGURE 3 – Dissection with cross-section of human skull. Temporal muscle outlined in yellow; insertion of the sphenomandibular muscle outlined in green; coronoid process outlined in red.



FIGURE 4 – Dissection with cross-section of human skull. Body of the sphenomandibular muscle outlined in yellow.

The reflection of structures and mapping of muscles was performed on eight anatomical sets (four cadavers); muscle origins were analyzed and both muscle body and insertions were described (Figure 2). On two anatomical sets (one cadaver), transverse sections (horizontal) were taken in 2 mm-thick slices, and each section was examined, as mentioned above. The topography and any relationships with contiguous structures were observed.

## RESULTS

Our analysis showed that the sphenomandibular muscle is independent of the temporal muscle, because its origin is in the zygomatic-frontal complex, lateral to the orbit and overlaying the fiber of the anterior bundle of the temporal muscle. This was the origin observed in all specimens, differently from the one described in the literature,

which indicates it to be in the infratemporal surface of the sphenoid bone and deeper than the fibers of the temporal muscle.

The body of the sphenomandibular muscle is separated from the body of the temporal muscle by a thin fascia and is inserted on an oblique line external to the mandible, therefore presenting its origin, body, and insertion independent of the origin, body, and insertion of the temporal muscle.

## DISCUSSION

In the original study by Dunn et al. (1), the sphenomandibular muscle was observed employing a new technique. A total of 1,800 transverse slices (1 mm in thickness) were made upon a human cadaver allowing each section to be removed, photographed, and analyzed. The authors observed that there were fibers, apparently of the temporal muscle, originating from the maxillary portion of the sphenoid bone, and not from the fossa of the temporal, from which the anterior fibers of this muscle originate.

In this study, we sought to determine the topography of the sphenomandibular muscle. From our dissections, the muscle was clearly displayed from its origin to its insertion and correlations, which allowed us to understand its function and thereby explain the implications of a hypothesized spasm on the adjacent structures.

Our analysis revealed that the fibers of the anterior bundle of the temporal muscle have their origin in the anterior surface of the temporal fossa, in a completely vertical disposition. The sphenomandibular muscle is located laterally to the anterior edge of the bundle, in a more superficial position and with a distal inclination, with its origin in the zygomatic portion of the frontal bone and the forward portion of the zygomatic bone. This description differs from that made by Dunn et al. (1), Ernest et al. (6), and Miller (2), who draw its origin from the maxillary portion of the sphenoid bone. Koritzer et al. (7) has previously argued that the sphenomandibular and the temporal muscle have different origins and identified the presence of a fascia separating them. This finding was confirmed by Borges (8).

Palomari et al. (9) have described these fibers to be components of the temporal muscle. However, in our study, the sphenomandibular and temporal muscles were found to have separate origins, body, and insertions, differing from one another and separated by a fascia (Koritzer, 1994).

The fibers of the sphenomandibular muscle have their insertion on the anterior border of the coronoid process and extending to the ramus of the mandible. When contracted, it performs a unique function in the elevation of the mandible through tension on the coronoid process. It acts, therefore, as kind of “mandible elevator,” similar to the masseter, medial pterygoid, and the anterior and medium temporal muscles (8). The sphenomandibular acts with the other elevators of the mandible in terms of the protrusion, retrusion, and lateral movement, remaining passive during the opening of the mouth.

Previous analyses of the topography of this muscle have indicated a clear relationship with temporomandibular disorders (10,11) in patients with muscle-related pathological conditions. This is true also when dysfunction compels the muscles of mastication to become hyperactive (8), thereby generating consequences for the stomatognathic system and/or neighboring structures.

## CONCLUSIONS

The results of this study permit the assumption that the sphenomandibular muscle is a separate entity, independent of the temporal muscle, with its fibers originating, not in the maxillary portion of the sphenoid bone, but from the zygomatic-frontal complex.

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