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Case Report
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Digastric muscle in human fetus: rare accessory belly or a new morphology?

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ABSTRACT

Introduction: the digastric muscle usually has two bellies, one anterior and one posterior, connected by an intermediate tendon. However, the presence of one or more accessory muscles present in the anterior belly of the digastric muscle has been widely reported in the literature over the years. These anatomical variations usually do not cause clinical symptoms, but they can make the interpretation of imaging tests difficult and lead to the occurrence of a wrong diagnosis, consequently, leading to unnecessary surgeries. The objective of this study was to report a rare accessory belly uniting the anterior bellies of the digastric muscle and to alert anatomical professionals about its morphology. During a dissection of a male human fetal cadaver at approximately 34 weeks of age, an accessory belly of trapezoid shape was found, connecting the anterior bellies of the digastric muscles. Its bundles initially had a parallel and oblique direction to later attach to the medial margin of the anterior belly of the right digastric muscle and its area was approximately 4.4 m² and a perimeter of 36.6 mm. Knowledge of the traditional and variational anatomy of the digastric muscle can be important for many procedures related to this region, including submandibulectomy, submental lipectomy, and rhytidectomy.

Keywords: Digastric Muscle; Suprahyoid Muscles; Anatomical Variation; Accessory Belly; Anterior Belly; Posterior Belly; Neck Dissection.

Introduction

The digastric muscle belongs to the compartment of the suprahyoid muscles and is normally formed by two bellies, one anterior and one posterior[1]. The posterior belly, longer than the anterior, originates in the mastoid notch of the temporal bone and runs anteroinferiorly. The anterior belly originates on the posterior surface of the inferior border of the mandible, in a region called the digastric fossa, and runs posteroinferiorly. The two bellies are joined by an intermediate tendon, which is connected to the greater horns and to the lateral part of the hyoid bone by a fibrous loop. The length of this loop varies considerably, so the distance between the tendon and the hyoid bone and the angle between the anterior and posterior bellies can vary[2,5].

The digastric muscle, like the other suprahyoid muscles, is very important in the physiological processes of mastication and swallowing. The anterior belly elevates and pulls the hyoid bone forward as food is passing from the mouth to the pharynx. The posterior belly, in turn, elevates and pulls the hyoid bone backwards after the passage of food, to prevent its reflux into the mouth. In addition, its two bellies help the jaw depression movement[2,3].

The digastric muscle is important in the anatomy of the cervical region because it divides the anterior cervical triangle of the neck into three smaller regions of great topographical value. The anterior cervical triangle, limited posteriorly by the margin of the trapezius muscle, is divided into four smaller triangles, three of which are delimited by the anterior and posterior belly of the digastric muscle. The submental, submandibular and carotid triangles are regions that house nerves, blood vessels, salivary glands and lymph nodes, in addition to other equally important structures of the cervical region. This topography is valuable for the recognition of these structures, in addition, they serve as reference points in the surgical approach to neck structures[3,4].

The arterial supply of the digastric muscle is different in the two bellies. The anterior belly is supplied by the submental branch of the facial artery, while the posterior belly receives blood supply from the posterior auricular and occipital arteries. The innervation of the digastric muscle is also distinct in the two bellies. While the anterior belly receives fibers from the mylohyoid branch of the inferior alveolar nerve, the posterior belly is innervated by fibers from

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the facial nerve[2,5-7].

The differences regarding the innervation and vascularization of the anterior and posterior bellies of the digastric muscle concern the embryological origin of the muscle. The anterior belly of the digastric muscle originates in the first pharyngeal arch, around the fourth week of development, while the posterior belly originates posteriorly in the second pharyngeal arch[5,8].

Anatomical variations of the digastric muscle have been common and widely described by authors such as Žlábek[9], Yamada[10] and De-Ary-Pires, Ary-Pires, Pires-Neto[1], who also created their own classification systems for the variations found. The anatomical variations of the digastric muscle have been more frequently found in its anterior belly, most often consisting of the appearance of oblique accessory muscle bundles between the two anterior bellies, not necessarily producing clinical symptoms[3,4,11].

Thus Šink, Umek, Cvetko[12], and Kim and Loukas[5], highlighted the anatomical study of the digastric muscle as fundamental for the recognition of its anatomical variations, in order to assist physicians in the diagnosis and treatment of their patients, since such variations can be misinterpreted as metastatic lymph nodes or tumor masses. The aim of the present study was to report the occurrence of a rare accessory belly uniting the anterior bellies of the digastric muscle and alert professionals in the clinical and anatomical areas about its morphology.

Case report

During routine human fetal cadaver dissection at approximately 34 weeks of age, at the Anatomy Laboratory of the Federal University of Sergipe, after removal of the platysma muscle and cervical fascia, a rare accessory belly of trapezoid shape was found, which connected the anterior bellies of the digastric muscle (Figure 1). Its bundles appeared to start at the end of the medial border of the lower third of the anterior belly of the left digastric muscle, initially taking a parallel and then oblique direction to attach to the middle third of the medial border of the anterior belly of the right digastric muscle.

This accessory belly had an area of approximately 4.4 m² and a perimeter of 36.6 mm, and was calculated using a public domain computer program for image processing called ImageJ (Figure 2).

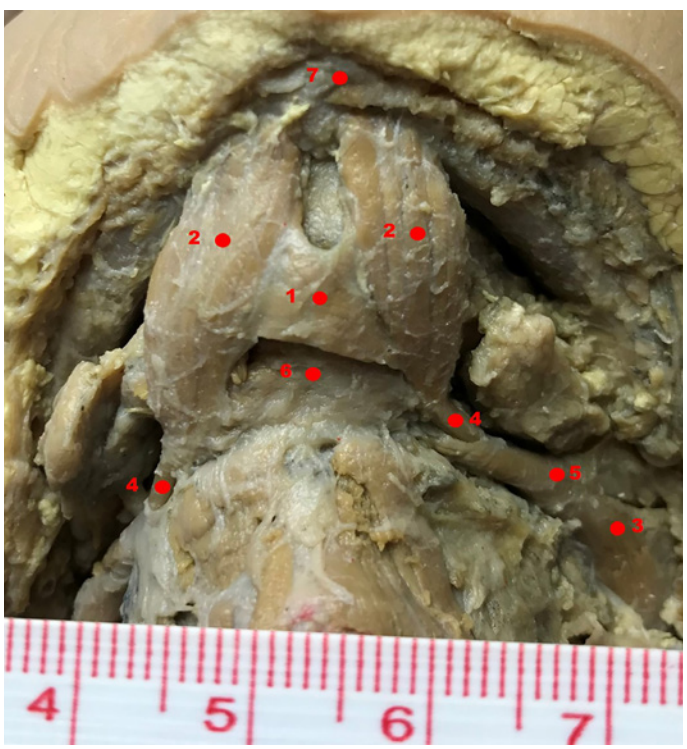

Figure 1. Accessory muscle bundle connecting the anterior bellies of the digastric muscle.
Legend:
1. Accessory belly of the digastric muscle
2. Anterior belly of the digastric muscle
3. Posterior belly of the digastric muscle
4. Intermediate tendon of the digastric muscle
5. Left stylohyoid muscle
6. Mylohyoid muscle
7. Mandible
* Accessory belly muscle bundle originating from the intermediate tendon of the anterior belly of the left digastric muscle

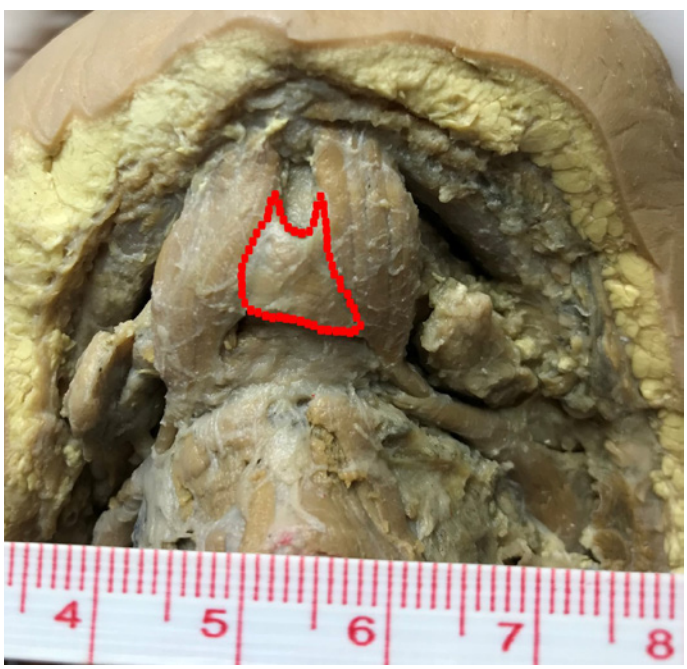

Figure 2. Area and perimeter of the accessory belly connecting the anterior belly of digastric muscles

Discussion

The muscular components of the pharyngeal arches derived from unsegmented paraxial mesoderm and prechordal plate form various muscles in the head and neck. The musculature of the first arch forms the mylohyoid and anterior belly of the digastric, that appear around the fourth week of intrauterine life and the second arch forms the posterior belly of the digastric[8]. For Šink, Umek, Cvetko,[12] the most plausible

reason to explain the formation of the accessory belly of the digastric observed, would be the heterogeneity of the embryological development of the 1st pharyngeal arch. Furthermore, the crossing of muscle fibers in the midline may be due to the proximity of the pharyngeal arches.

Anatomical variations of the digastric muscle are reported in the literature[11-20]. These variations mainly involve the anterior belly of the muscle and, in particular, the number of anterior bellies or the presence of accessory bundles originating from a common tendon or the intermediate tendon[21,22]. These anatomical variations of the anterior belly of the digastric muscle occur at the rate of 5.9% to 65.8% of the population[5,9,10,20,23,24], highlighting ethnicity as the most frequent factor in the occurrence of these variations. The data contained in the literature show a higher prevalence of these variations in the Asian population, especially the Japanese. While in the general population a rate of 31.4% was found, in the Asian population the rate was 51.7% for the occurrence of anatomical variation of the digastric muscle. This data suggests that the occurrence of anatomical variations of the digastric muscle is more frequent among the Asian population[1,5,10,21,24-26].

In general, when we analyze the variations of the digastric muscle in relation to sex, we can observe that this occurrence is slightly higher in males (35.5%) compared to females (30.1%)[1,5,20,25,27,28].

In general, the variations of the anterior belly of the digastric muscle were extensively addressed by Žlábek[9], and Yamada[10], who created their own classification systems based on their positions. The finding of the present article, following this classification, can be classified as the type of insertion, which is characterized as due to the occurrence of fixation at the tendon intersection. However, instead of attaching to the mylohyoid raphe or even to the mylohyoid muscle, the accessory muscle reported in the present case crossed the midline and was attached to the medial border of the right anterior belly of the contralateral digastric muscle. As for the midline crossing, Ozgur *et al.*[24], Šink, Umek, Cvetko,[12] and Ortug, *et al.*[29], classified the accessory belly that crosses the midline, regardless of attachment to the mylohyoid muscle, as crossed type. Thus, based on these classifications, this accessory muscle described in the present study can be characterized as a junction of these two types, that is, accessory belly of the insertion and crossed type.

The clinical implications of anatomical variations of the digastric muscle are important, as they are often confused with masses or lymph nodes in the neck region. Their knowledge is therefore relevant in surgeries involving the submandibular region, such as facial paralysis correction surgery and cosmetic surgery[11,30].

Conclusion

The present report highlighted the importance of understanding the anatomy of the digastric muscle, as well as recognizing the anatomical variations that may occur between the anterior bellies of the digastric muscle. Due to its topographic disposition and its close relationship in the delimitation of the trigones located in the neck region, which are relevant in the surgical approach and in diagnostic imaging, recognizing the presence of an accessory muscle between the anterior bellies of the digastric muscle is important for head and neck surgeons and plastic surgeons in submandibulectomy, submental lipectomy and rhytidectomy surgeries.

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