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CASE REPORT

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Five-headed superior omohyoid

K. Maślanka[1], N. Zielinska[1], R.S. Tubbs[2–7], B. Gonera[1], K. Ruzik[1], Ł. Olewnik[1]

[1]*Department of Anatomical Dissection and Donation, Medical University of Lodz, Poland*
[2]*Department of Anatomical Sciences, St. George's University, Grenada, West Indies*
[3]*Department of Neurosurgery, Tulane University School of Medicine, New Orleans, Louisiana, United States*
[4]*Department of Neurology, Tulane University School of Medicine, New Orleans, Louisiana, United States*
[5]*Department of Structural and Cellular Biology, Tulane University School of Medicine, New Orleans, Louisiana, United States*
[6]*Department of Surgery, Tulane University School of Medicine, New Orleans, Louisiana, United States*
[7]*Department of Neurosurgery, Ochsner Medical Centre, New Orleans, Louisiana, United States*

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The omohyoid is an infrahyoid muscle with two bellies. It is responsible for lowering and positioning of the hyoid bone. It is morphologically variable in the origin, insertion and morphology of its bellies. Quantitative variations of the superior belly of the omohyoid muscle are not common. We present a case of a five-headed superior omohyoid, and a short clinical review related to this muscle. All the bellies had their origin in an intermediate tendon and were attached to the hyoid bone. The volume of its superior part was greater than usual. Knowledge of the anatomy of this muscle is important, especially for surgeons operating in the anterolateral neck region. (Folia Morphol 2023; 82, 4: 975–979)

Key words: omohyoid muscle, compression, additional head, clinical implications, myofascial pain syndrome, plastic surgery, reconstructive surgery

INTRODUCTION

The omohyoid muscle (OH) is the long thin muscle that runs obliquely in the lateral cervical region [9, 22]. Traditionally, it has two bellies, superior (OMS) and inferior (OMI), which are united by an intermediate tendon connected to the clavicle by a fascial sling [22]. The inferior belly arises and shifts to the intermediate tendon from the superior margin of the scapula, medial to the scapular notch [14]. The superior belly begins in the intermediate tendon and is inserted to the inferior border of the hyoid bone. It is positioned superficial to the phrenic nerve and brachial plexus and lies superficial to the internal jugular vein [19, 29, 30]. The OMS is innervated by terminal branches of the ansa cervicalis, but no direct branches to the OMI have been found to date [15]. The blood supply to the omohyoid comes from the superior and inferior thyroid arteries [8, 16]. This article pays particular attention to the upper part of this muscle.

The OMS has many anatomical variations in its insertion, course and number of bellies [3, 17, 34]. A one-sided lack of it has been reported, but this is very rare [6, 32, 33]. Sukekawa and Ito [29] proposed a classification into several types of superior belly. Their type III included an OMS that can consist of three to five bellies, but as they admitted, their cases of four or five-headed OMs were unclear and were speculative [29].

The following case describes the separate and clear appearance of a five-headed OMS.

Address for correspondence: Ł. Olewnik, MD, PhD, Department of Anatomical Dissection and Donation, Chair of Anatomy and Histology, Medical University of Lodz, ul. Żeligowskiego 7/9, 90–410 Łódź, Poland, e-mail: lukasz.olewnik@umed.lodz.pl

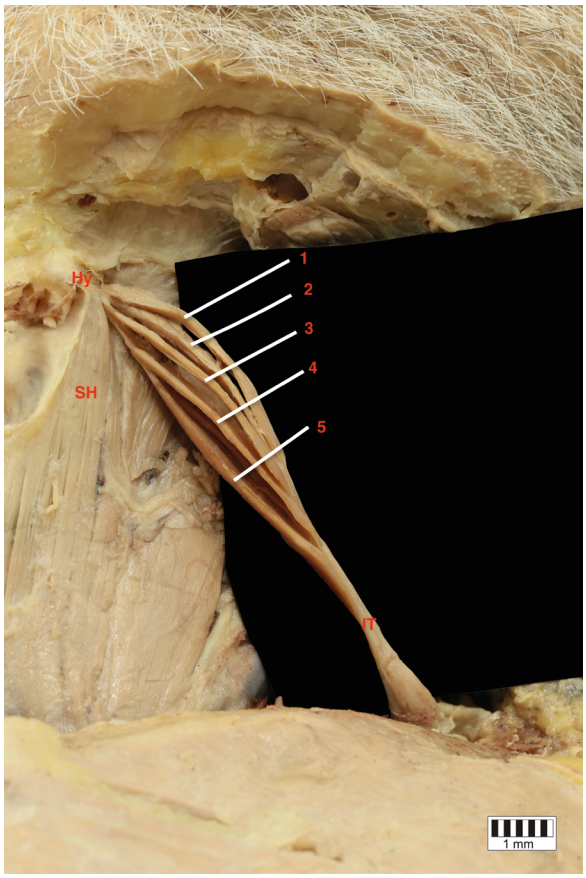

Figure 1. Five-headed omohyoid muscle. Neck. Hy — hyoid bone; SH — sterno-hyoideus; IT — intermediate tendon of omohyoideus; 1 — first head of the omohyoideus; 2 — the second head of the omohyoideus; 3 — the third head of the omohyoid muscle; 4 — the fourth head of the omohyoid muscle; 5 — the fifth head of the omohyoideus.

CASE REPORT

During a dissection performed for research and didactic purposes at the Department of Anatomical Dissection and Donation, Medical University of Lodz, we noticed supernumerary heads of the OM. The subject of investigation was the neck of a 76-year-old male cadaver. The donor had no surgeries in the neck area. The dissection was performed by the traditional anatomical method [20, 25]. Each belly of the OM was thoroughly dissected to visualise its origin and insertion.

In the present case, the OMS was represented by five separate heads (Fig. 1), which had origin in the intermediate tendon that unites the superior and inferior bellies. At this point, the muscle was 8.19 mm wide and 3.96 mm thick.

All the distinct heads had a distal attachment on the inferior border of the hyoid bone. The first head was shortest (38.6 mm long). Its width and thickness were 2.96 mm and 0.61 mm, respectively, at the point of transition to the tendon, which was 2.82 long.

The second head was little longer than the first (39.19 mm). The proximal end of the belly was 4.53 mm wide (the widest of all five) and 0.69 mm thick. The tendon was 2.28 mm long.

The third head was 46.6 mm long. In the point of origin, its width was 2.74 mm and its thickness was 0.18 mm (the thinnest of all). Its tendon, which was attached to the intermediate tendon, was just 1.70 mm long.

The width of the fourth head in its proximal part was 1.82 mm; its thickness here was 0.26 mm. This head was 51.02 mm long and the tendon was 3.48 mm. The fifth, final head was the longest of all (59.8 mm). Its tendon is also the longest of all (10.99 mm). The point of the belly arising from the tendon was 3.12 mm wide and 0.56 mm thick.

The inferior belly of the omohyoid was also measured. Its dimensions were greater than those of the OMS. In its distal part the width was 7.68 mm and the thickness was 3.89 mm. Its length could be as much as 84.16 mm, more than twice as long as the first and second bellies. The third head of the OMS was 55.4% of the length of the OMI, the fourth head was 60.6% and the fifth 71%.

Importantly, we noticed a vague division into two main layers of the hyoid muscle, superficial and deep. The superficial layer contained the first, second and third bellies, while the deep layer was formed by the fourth and fifth bellies. We believe that this could be an interesting point of departure for researchers in future studies on the omohyoid muscle.

An electronic calliper (Mitutoyo Corporation, Kawasaki-shi, Kanagawa, Japan) was used for measurements. Each measurement was obtained twice by different researchers with an accuracy of up to 0.1 mm (Table 1).

DISCUSSION

The omohyoideus is formed by myoblasts from the cervical myotomes and is the fastest growing infrahyoid muscle during fetal life [11]. The extent of development of the infrahyoid muscles is very diverse [2, 22]. Anderson's hypothesis was that only the superior belly is the true infrahyoid muscle, while inferior belly shares its embryology with the subclavian muscle. This hypothesis is corroborated by the case of clavicular attachment of the OM [28]. This muscle has the same primordium as the sterno-

Table 1. Measurements of individual heads of the omohyoid muscle

	1st head	2nd head	3rd head	4th head	5th head
Length	38.6 mm	39.19 mm	46.6 mm	51.02 mm	59.8 mm
Tendon					
Length	2.82 mm	2.28 mm	1.70 mm	3.48 mm	10.99 mm
Insertion	Inferior border of the hyoid bone				
Width	8.19 mm				
Thickness	3.96 mm				
Origin	Intermediate tendon of the omohyoid muscle				
Width	2.96 mm	4.53 mm	2.74 mm	1.82 mm	3.12 mm
Thickness	0.61 mm	0.69 mm	0.18 mm	0.26 mm	0.56 mm

hyoid muscle, which is probably why they frequently merge [18].

The upper part of this muscle is highly variable, but the additional heads described are unusual and very rare [26, 29]. Some of them have significant clinical relevance in many areas, which makes it an important and at the same time interesting object of research [22].

One of the most common abnormalities of the OM is the junction of the OMS with the sternohyoid muscle, mentioned earlier [22]. Also, a large part of it is cleido-hyoideus, by which the inferior belly is attached to the lateral part of the clavicle while the superior belly is attached to the lateral part of the body of the hyoid bone [3, 14, 22]. These two types are part of the classification of variability proposed by Kasapoglu and Dokuzlar [12] in 2007 and constitute types III and II respectively. Type IV has a superior normal belly with fibres received from the sternum. Previously, anomalies of this muscle were classified into six types by Miura et al. [17], and more than a century ago into five types by Loth [see 5]. Sukekawa and Ito [29] in 2005 classified the OMS into four types. Our case corresponds to the third type in their classification.

Duplication of this muscle is also not uncommon and has been described several times [1, 17, 35]. Also interesting is its total absence, which has been described by Tamega et al. [32], Bergman et al. [2], and Thangarajan et al. [33]. It should be noted that this muscle is the most frequently absent of all the infrahyoid group [2]. An OMS consisting of several heads has probably only been presented previously by Sukekawa and Itoh [29].

As mentioned earlier, this muscle often undergoes fusion for reasons of embryology [2]. A classical illustration is a combined OM and sternohyoid muscle — a sternoomohyoideus [17]. The connections between them are very different, as described by Miura et al. [12]. The cleidohyoideus originates from the cledoidomastoid part of the sternocleidomastoideus [2]. However, from a clinician's point of view, the connection with the cervical fascia seems most important [2, 22]. The cleidofascialis and hyofascialis are examples of variations that can impose more tension on the cervical fascia, increasing internal jugular vein (IJV) compression, thereby impairing blood flow in this vessel. Moreover, this variability presumably affects the occurrence of omohyoideus myofascial pain syndrome [23].

The omohyoideus is of great interest because of its clinical importance [22]. First, it divides the posterior and anterior cervical triangles into smaller ones. These muscles are the surgical landmark for the IJV, brachial plexus, and levels 3 and 4 lymph node metastases [12, 13, 24]. Because of this, lack of or a highly variant course of the OM can be particularly dangerous during surgery in the anterolateral neck region. Also, because of this close correlation with the IJV, the course or contraction of the muscle affects the vessel lumen and its haemodynamics [21, 38]. The variability of its length is key to this aspect, as a short OM markedly increases the compression force on the IJV [21]. As noted previously, the area of the OM also contains the brachial plexus, which can be irritated by a hypertrophied OM [7]. Fibrosis of the OM in specific cases can cause torticollis, according to Shih and Chuang [27]. Tubbs et al. [34] presented an unusual origin of the OM that could significantly affect not only omohyoideus function but also cervical spine biomechanics.

The omohyoid muscle, especially its upper belly, is often used in reconstructive and plastic surgery [37]. In laryngeal paralysis, surgeons use the OM to restore normal function [4]. When a small patch is needed for reconstruction, for example in facial reanimation surgery, vocal reconstruction, sphincters or blink restoration surgery the OMS could be used, but more anatomical research on it is needed to optimise this process [19]. Surek and Girod [31] described the use of the OMS to repair cervical oesophageal perforation. The course of the omohyoid muscle is also extremely useful during vagus nerve stimulator implantation [36].

CONCLUSIONS

We report a case of a five-headed omohyoid muscle. Owing to its embryology, the omohyoideus

is highly variable. Its location makes it extremely important during surgical procedures within the anterolateral neck and for the haemodynamics of the head and neck veins. Recently, its potential has been recognised in plastic and reconstructive surgery, but further anatomical and functional studies are necessary to realize its full potential in this area of medicine.

Ethical approval and consent to participate

The study protocol was accepted by the Bioethics Committee of the Medical University of Lodz. The cadavers were the property of the Department of Anatomical Dissection and Donation, Medical University of Lodz, and of the Donors and Dissecting Rooms Centre, Universidad Complutense de Madrid, Spain. Informed consents were obtained from all participants before they died.

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Conflict of interest: None declared

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