

Case Report

The Anomalous Human Levator Clavicularae Muscle: A Case Report

Kunwar P Bhatnagar^{1*} and Timothy D Smith²¹Department of Anatomical Sciences and Neurobiology, University of Louisville, USA²School of Physical Therapy, Slippery Rock University, USA***Corresponding author**

Kunwar P Bhatnagar, Department of Anatomical Sciences and Neurobiology, University of Louisville, 7000 Creekton, USA, Tel: 150-2456-4779; Email: bhatnagar@louisville.edu

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- omo-trachelian
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- Sternomastoideus

Abstract

This case report describes the observation of a unilaterally present anomalous levator clavicularae muscle in a 66-year-old human male. The observations were made during routine laboratory dissections. In our 80-some years of cumulative human dissection education prior to this detection, this was the first observation (with about 45 cadavers dissected yearly) of this muscle. The levator clavicularae muscle was observed with intact nerve supply from the ventral ramus of C3, indicating its functional status.

The muscle was lambda (λ)-shaped with its stem oriented cranially, attaching to the fascia of the longus capitis muscle at the level of the transverse process of the fourth cervical vertebra. More inferiorly, the stem splits into a pars medialis and pars lateralis each with fascial attachments to the clavicle within the middle third of the bone. Both parts had fascial attachments to the clavicle within the middle third of the bone, and the lateral part passed medial to the external jugular vein. Elsewhere in the neck, the inferior belly of the omohyoideus muscle also split into medial and lateral heads, attaching separately to the scapula. Knowledge of infrequent anatomical anomalies is helpful in isolating pathologies (e.g., cervical cancers) from other infrequent, but non-pathological structures that may be detected in routine screenings. Lastly, in a review of comparative anatomical findings, we assert the levator clavicularae muscle is a partial homologue of the omocervicalis of other mammals.

INTRODUCTION

The levator clavicularae is an anomalous muscle that passes from the mid-cervical vertebral level to the clavicle. It is rare in humans [1,2] and similar variants are known in other mammals (see below). Embryologically, the levator clavicularae belongs to the sternomastoid-trapezius group which takes its origin from the accessorio-cervical primordium. This variant muscle could be attributed either to the levator scapulae or scalenes topographically, yet such a conclusion is not supported on ontogenetic or phylogenetic grounds [3].

The muscle has a history of varied nomenclature (Table 1, see references therein). It has been specifically called the cleido-cervicalis and cleidotrachelian in human studies, and omo-trachelian in studies of other mammals (the latter term sometimes used for humans as well). Other named muscles that occupy the same vicinity have been described, such as cleido-occipitalis. Based on origins and insertions alone (Table 1), there is reason to doubt that the described muscles represent homologous elements. In many but not all of the works that used the above muscle names, cervical attachments are specified, but sometimes at the highest cervical levels and sometimes at lower levels. Moreover, the cleido-occipitalis [4] has occipital-

to-clavicular attachments. In other mammals, the omo-cervicalis (omotransversarius) has similar attachments [5].

For the reasons outlined above, the levator clavicularae can be regarded as one element among a small number of muscles that belong to the region of the trapezius and levator scapulae. However, possibilities that distinct variants exist as opposed to variable attachments of a single muscle remain two viable conclusions at present. Because there

are so few reports, it is difficult to conclude which explains the variants seen in humans.

In addition, its frequency remains highly tentative. Indeed, in our own experience of a cumulative 80 years of continual dissecting instruction, the present case represents our first observation of the anomaly. This report adds to the state of knowledge on this rare variant.

CASE PRESENTATION

During routine laboratory dissection of an embalmed, 66-year-old male cadaver, a rare abnormal neck muscle was observed unilaterally on the right side. Then, the posterior and anterior triangles of the neck were carefully dissected to expose the relationship of this muscle to adjacent structures

within the neck, as well as its innervation. The dissected regions were photodocumented and subsequently an illustration was prepared.

Table 1: Selected data on anomalous neck muscles.

Nomenclature used	Attachments	Comments	Source
levator claviculae	fascia of the longus capitis muscle (C4 level); two heads (medial and lateral) with fascial attachments to the clavicle		this study
levator claviculae	atlas, axis; acromial end of clavicle	may attach to "distal cervical vertebrae" (p 435); innervated by cervical ventral rami that also go to trapezius	[16]
levator claviculae	upper neck; lateral third of clavicle		[3]
levator claviculae	"up to the level of the transverse process of C3;" middle or lateral third of clavicle	attachments inferred from CT scans	[17]
levator claviculae	atlas, axis; lateral third of clavicle, posteriorly		
levator claviculae	"from the medial part of the neck to the middle portion of the claviculae"	detected by sonography (implicated in thoracic outlet syndrome)	[18]
levator claviculae	C3, posterior tubercle; posterior margin of the clavicle	seen in conjunction with a third head of sternocleidomastoid m.	[19]
levator claviculae	transverse process of the C2-C3; middle third of the clavicle.	innervated by a small branch from the medial supraclavicular nerve	[20]
cleido-cervicalis or levator claviculae	axis; middle third of clavicle, posteriorly	anterior to omohyoid; omohyoid has two of origin for superior belly	[21]
cleido-cervicalis	C6, anterior tubercle of transverse process; lateral clavicle		[10]
cleido-cervicalis	C6, anterior tubercle of transverse process; superior margin of clavicle		[4]
cleidotrachelian	C3, C4 transverse process, superficial to omohyoid	similar to this study, notes double innervation	[9]
cleido-occipitalis	cranial part with trapezius; posteriorly on lateral third of clavicle		[22]

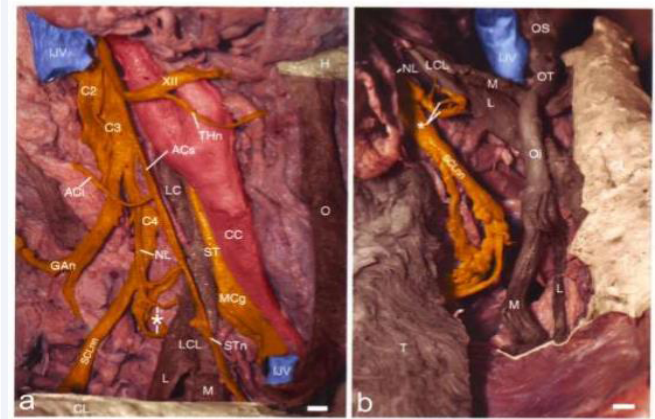


Figure 1 Photograph of the anterolateral neck, color-enhanced to demonstrate structures.

The sternocleidomastoid muscle is reflected. a) anterolateral view showing the levator claviculae muscle (LC) including the medial and lateral heads (M,L) inferiorly. * denotes to nerves to the levator claviculae. b) Superolateral view, showing the omohyoid muscle, including the medial and lateral heads (M,L) of the inferior belly of the omohyoid (Oi).

Abbreviations: ACs/i: ansa cervicalis, superior/inferior root; C2, C3, C4: ventral rami of cervical spinal nerves; CC: Common Carotid Artery; CL: Clavicle; GAn: Greater Auricular Nerve; H: Hyoid bone; IJV: internal Jugular Vein; MCg: Middle Cervical Sympathetic Ganglion; NL: Nerve Loop; O, superior belly of the omohyoideus muscle; OT: Omohyoid Inter-Tendon; SCLnn: supraclavicular nerves; ST: Sympathetic Trunk; T: Trapezius muscle; THn: Nerve to thyrohyoid; XII, hypoglossal n. Scale bar, 10 mm.

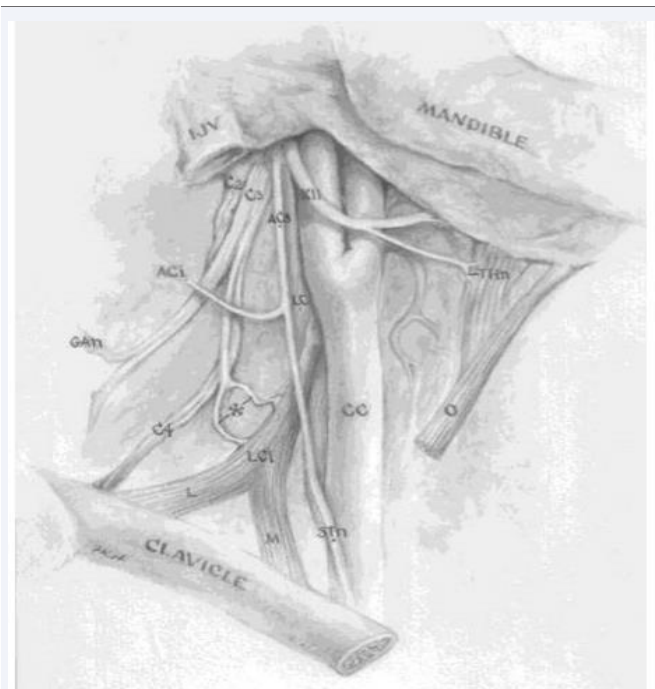


Figure 2 Illustration of the dissection of the right cervical triangles in the male human cadaver.

Abbreviations: ACi, ansa cervicalis, inferior root; C2, C3, C4: ventral rami of cervical spinal nerves; C2-C4; CC: common carotid artery; GAn: greater auricular nerve; H: hyoid bone; IJV: internal jugular vein; LC: longus coli muscle; LCL: levator claviculae; muscle; L, M, lateral/medial belly; O: superior belly of the omohyoideus muscle; SCLnn: supraclavicular nerves; STn: nerve to sternothyroid; THn: nerve to thyrohyoid; XII, hypoglossal n; *nerves to the levator claviculae

The anomalous muscle was observed unilaterally in the posterior triangle of the neck on the right side (Figure 1). Further careful dissection revealed the muscle had a branched configuration, with a single cervical attachment and two clavicular attachments.

The inferior belly of the omohyoid also split into two parts, and is described below. The levator claviculae muscle (Figures 1,2) was lambda (λ)-shaped with its stem oriented cranially, attaching to the fascia of the longus capitis muscle at the level of the transverse process of the fourth cervical vertebra. The 9 mm wide stem abruptly splits into a pars medialis (70 mm long, 7 mm wide) and a pars lateralis (77 mm long, 8 mm wide). Both parts had fascial attachments to the clavicle within the middle third of the bone, and the lateral part passed medial to the external jugular vein, and attached 28 mm laterally on the clavicle. The innervation of the levator claviculae muscle included two nerve bundles. Both of these stemmed from the ventral ramus of the third cervical nerve before it joined the fourth cervical nerve. These bundles enter the upper unsplit part of the levator claviculae (the "stem"). The remainder of the nerve which continues inferiorly to supply the infrahyoid muscles. Neighboring vessels supply blood to the levator claviculae.

Elsewhere in the neck, the 82 mm long and 11 mm wide superior belly of the omohyoid was attached to the hyoid bone, passing inferolaterally to the carotid sheath under the sternocleidomastoid muscle. The intermediate tendon was slightly lateral to the carotid sheath and medial to the sternocleidomastoid. The inferior belly of the omohyoid passed posteromedially to the inferior part of the external jugular vein just before that vein drains into the subclavian vein. The inferior belly measured 59 mm long and 9 mm wide and branched into a pars lateralis (37 mm long, 4 mm wide) that attached to the superior scapular margin just lateral to the scapular notch (Figure 2). It was enclosed in thick fascia. The pars medialis (39 mm long, 7 mm wide) attached to the scapula just medial to the pars lateralis with a gap of less than 1 mm between the two attachments (Figure 1b).

DISCUSSION

Broadly, human muscle anomalies occur commonly. Wood (1868) even estimated about 10 muscle variants occur for every individual. Whereas anomalous omohyoideus, digastric and sternohyoid muscles are relatively common [6], certainly compared to the incidence reported for the levator claviculae (reported between one to three percent by Le Double, Testut [1,2]).

On the relationship of the levator claviculae to existing muscles and other variants The levator claviculae muscle was observed and reported as early as 1901 by Corner [7] based on a patient (Table 1). The earliest name given this muscle was omo-trachelian (omo, Greek, meaning the shoulder; trachelos, Greek, meaning the neck; Skinner, [8]). Apparently ignorant of the literature already existing (see Table 1) on this anomalous muscle, Newell [9] noted that "no muscle with this origin, from and insertion has previously been described in man." Note that Newell cited at least five reports on the omotrachelialis muscle, yet he proposed the name cleido-trachelien muscle.

Regarding the levator claviculae, it has been reported to be remarkably well developed in some individuals, with viable nerve supply (as our observations also suggest), and thus is presumably functional Corner [7]. The muscle has been theorized to be a part of the sternomastoid. Indeed, any number of other variant muscles occur in the region. There is a long history of sporadic reports of muscles including the cleidocervical (Tomo et al., 1994; Nagashima et al., [10] tracheloclavicularis imus [11], omocervicalis [12,13] levator claviculae Parsons [5], omotrachelian [5] and musculus cucullaris (Myauchi and Kato, 1983; = sternomastoid + omocervicalis, [12]). Of these muscles, many have been reported in other mammals, some being quite common.

COMPARATIVE ANATOMY

In contrast to humans, the levator claviculae is frequently present in mammals, although more often termed omotrachelian (e.g., see Parsons [5]. McKenzie [14] emphasized that the sternomastoid muscle is not similar in its component parts in all mammals. The *Nomina Anatomica* (7th Ed) recognizes four parts of this muscle. Noting the rampant variability of the omocervicalis (or omotransversarius), McKenzie suggested its intimate relationship with the deep head of the sternomastoid. He further argued that if the attachment of the omocervicalis in various mammals (see figure 1 in McKenzie [14] which vary all the way from the lateral end of scapular spine to the middle of the clavicle, and at the same time have its upper attachment migrating between the base of the skull to the upper cervical vertebrae. Given that, the deep portion of the sternomastoid muscle may represent the omocervicalis or a part of that muscle. Citing Giebel (1874-1900), McKenzie believed that the omocervicalis is represented within the human sternomastoid.

CONCLUSION

In recent years modern techniques have made it possible to interpret and sort out soft tissue shadows (observed radiographically) from cancerous cervical nodes (Fasel et al., [3]). Knowledge of muscle variations therefore is of clinical relevance, since radiologists may encounter these variants during imaging, at which time they must be differentiated from pathologies [15]. Subsequently, the frequency of levator claviculae has been variously reported between one to three percent [1,2]. Because there are so few reports in the literature its actual frequency may be more, or may be less than 1%. Our observations add more information to variation in this element, which may provide clinicians with more information going forward.

Our study also provides the basis to hypothesize which variants described in the literature may actually be homologues, based on human variation and comparative anatomy. We suggest that the most primitive attachments of the levator scapulae spans the distance between C1 and the clavicle. This conclusion is bolstered by occasional observations of those attachments in humans e.g., Corner [7] and by our own observation that the fascia covering the levator scapulae merges with the prevertebral fascia that covers the longus capitis muscle. Prevertebral fascia also runs superficial to other deep cervical muscles and the lateral masses to which many attach. In our opinion, variant muscles that arise from the skull base (e.g., the cleido-occipitalis) may

have a closer developmental relationship with the omocervicalis of other mammals, based on some shared attachment sites [14].

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