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CASE REPORT

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Levator claviculae: a case report and review of the literature

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The levator claviculae is an uncommon anatomical variant found in the posterior cervical triangle. In this report we present a 78-year-old man with this muscular variation, which was found during gross anatomical dissection. While sites of insertion and origin have been variable, in the present case the muscle originated from the left transverse processes of C3 and C4, and inserted onto the lateral third of the ipsilateral clavicle. Clinical considerations of this variant anatomy are of interest, as they may present in patients as a supraclavicular mass and may also mimic pathology on cross-sectional imaging. (Folia Morphol 2008; 67: 307–310)

Key words: anatomy, neck, cervical, clavicle

INTRODUCTION

The levator claviculae is a very rare variation of the cervical musculature, although it is observed regularly in certain mammalian species [7, 14, 17]. It lies in the posterior cervical triangle of the neck, usually arising from the transverse processes of the upper cervical vertebrae or the ventrolateral muscles of the neck. The specific tendinous insertion sites vary slightly, with attachments to the lateral aspect of the clavicle, the acromion, or the trapezius [1, 7, 10]. O'Sullivan and Kay [12] described the variation as a muscular slip that originates from the trapezius, traverses anterior to the scalene muscles and inferior belly of the omohyoid and posterior to the spinal accessory nerve, before inserting on the posteromedial aspect of the clavicle just lateral to the sternocleidomastoid. The levator claviculae occurs more often unilaterally than bilaterally, with a left-sided predominance [14]. Capo and Spinner [2] reported a left-sided levator scapulae muscle, which arose from the anterior tubercle of the C2 transverse process and inserted onto the lateral clavicle. Bilateral reports have been documented as well, although these are much less common [3, 14]. The nerve supply of the levator claviculae has been described as arising from a branch of the fourth cervical nerve and its blood supply as stemming from the ascending cervical artery [8, 11]. Here we present a case report, as well as a review of the literature, to demonstrate the potential importance of this rare anatomical variation.

CASE REPORT

We present a case of the unilateral occurrence of a levator claviculae in a 78-year-old male human cadaver (Fig. 1, 2). The levator claviculae was discovered during the routine anatomical dissection of the posterior cervical triangle at the University of Alabama at Birmingham during 2008. The cadaver did not show any other gross abnormalities or evidence of procedures involving the head and neck.

The origin of the levator claviculae was from the lateral aspect of the left transverse processes of the C3 and C4 vertebrae. A flat muscle belly 12.2 cm in

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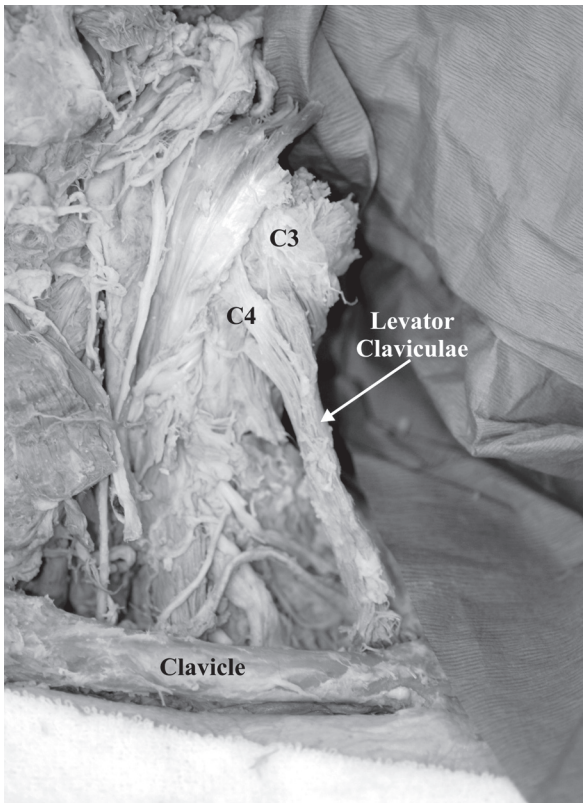

Figure 1. Levator claviculae muscle with its origin and insertion.

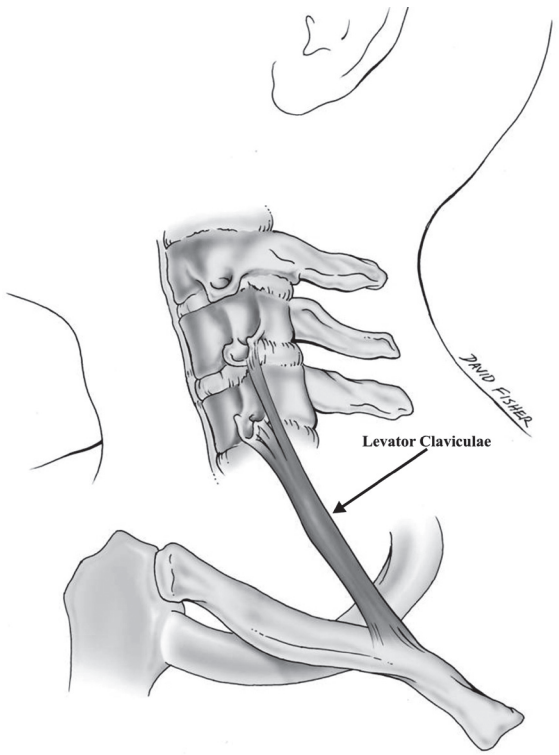

Figure 2. Diagrammatic representation of the levator claviculae with its origin and insertion.

length inserted into the posterior aspect of the lateral third of the clavicle. In its upper two-thirds the muscle was covered by the sternocleidomastoid and lay anterior to the omohyoid and anterior and middle scalene muscles. It was located lateral to the carotid sheath, phrenic nerve, supraclavicular nerves and suprascapular artery. The spinal accessory nerve within the posterior cervical triangle as it travelled to the trapezius muscle separated the levator claviculae from the anterior edge of the trapezius muscle. The thickness of the levator claviculae at its midpoint was 1.4 cm. The nerve supply was derived from small branches of the fifth and sixth cervical nerves. An arterial supply was not identified.

DISCUSSION

The levator claviculae is a rare anatomical variation of the cervical musculature in humans. In the literature the levator claviculae has also been referred to as the omocervicalis, cleidocervicalis and trachelo-acromial muscle, with the variation in names indicating different sites of origin and insertion [7, 15]. This diversity in nomenclature should perhaps be modified to reflect exclusively the origin and insertion on a case-by-case basis. The first documented observation of this muscle occurred in an anatomical painting by Leonardo da Vinci, as noted by Capo and Spinner [2]. However, the first recorded case of the levator claviculae was not reported until much later, in 1813, by Kelch (as cited by Rosenheimer at al. [13]). Even Darwin noted finding it among his human cadavers, with a report of the bilateral finding of the muscle [3]. Huxley [7] and Wood [20] both reported cases of the levator claviculae around a similar time, demonstrating that the muscle has a predominantly unilateral occurrence. Few reports have since surfaced in the literature, with fewer than 15 case reports and studies published regarding the prevalence, suspected phylogeny, and clinical relevance of this muscle within the past 200 years [4, 6, 9, 20]. In spite of these findings, most sources cite a population incidence of 2–3%, a figure attributed to Wood's findings [20]. Although most published works continue to support this rate of incidence, the occurrence of this anatomical variant may be overestimated, as we have only witnessed two cases of this muscle in approximately 2000 cadaver dissections. Nevertheless, the levator claviculae remains

an uncommon finding within human anatomy. Interestingly, it is nearly always present in most other mammalian species, including gibbons, orangutans, and chimpanzees, although not consistently in the last of these [3, 7, 14]. This muscular variant is also found in other vertebrate species, such as felines, although often with deviations in the common nomenclature [18]. A phylogenetic explanation for its disappearance in humans has not yet been put forward.

The embryological origin of the levator claviculae remains largely unknown. Several possible theories have emerged on the basis of the phylogeny and topography of the muscle. Gray originally depicted the levator claviculae as a variant of the levator scapulae in his anatomical manual [19]. Recent reports have delivered a number of theories concerning the origin of the muscle from the sternocleidomastoid, the anterior scalene and the longus colli muscles [8]. Fasel et al. [5] postulated that the levator claviculae is associated with the sternocleidomastoid and trapezius, owing to a similar development from the accessorial-cervical primordium. Subsequently, they ruled out the possibility of the development of the muscle from the scalenes or levator scapulae, stating a lack of ontogenetic or phylogenetic support [5]. Recently Leon et al. [8] have suggested the development of the muscle from the ventrolateral primordial muscles of the neck.

This anatomical variant has become more clinically relevant given the accelerating use of cross-sectional imaging, including computed tomography (CT) and magnetic resonance imaging (MRI). This has allowed for further characterisation of the muscle with the use of three-dimensional reconstruction. CT and MRI have also enabled us to further study its occurrence by non-invasive methods [5]. From a clinical standpoint, the levator claviculae can mimic pathological masses. It has been reported to have been discovered incidentally by CT scanning as a soft tissue density mass in the supraclavicular fossa, which may resemble lymphadenopathy in the spinal accessory group of nodes [16]. Rudisuli [15] documented a case of a man with non-Hodgkin's lymphoma of the epipharynx, who presented with this unilateral muscle together with multiple lymph node metastases. On CT imaging it may therefore mimic lymph nodes if not followed carefully throughout its course. Rarely this could impact tumour staging and treatment planning [15]. There have also been case reports of the levator claviculae mimicking a mass on physical examination. Rosenheimer et al. [13] reported a case of a patient with breast cancer, where this muscle, imitating suspicious lymphadenopathy or metastatic disease, was brought to attention in physical examination. In another report, a patient presented with an asymptomatic hard palpable mass over the clavicle. This was found to relate to an angular deformity in the mid clavicle at the tendinous insertion site of the levator claviculae [16]. Awareness of this variant may help to differentiate it from true pathological lymphadenopathy, such as that seen in lymphoma or head and neck carcinomas, and may reduce unwarranted follow-up studies.

Beyond mimicking pathology, the functional utility of the levator scapulae remains unclear. Capo and Spinner [2] have postulated that the levator claviculae evolved in an analogous fashion to the anterior scalene, thus assisting in elevating the ribs during the process of respiration. In view of its anatomical position, shortening of the muscle fibres could translate into an elevation of the clavicle, but there is little substantial evidence to support this theory. Further areas of research could investigate variations of measured muscle size in patients known to use accessory muscles for inspiration, such as those with chronic obstructive pulmonary disease. It may also be helpful to perform functional studies such as PET-CT or EMG to demonstrate which manoeuvres employ this muscle.

Our findings concerning the levator claviculae muscle are similar to other case reports, with the muscular slip arising from the upper cervical vertebrae and inserting onto the lateral aspect of the clavicle. Few studies have identified the nerve supply of the muscle, although Leon et al. [8] did suggest an innervation from the fourth cervical nerve. However, in the present study, the muscle was innervated by the fifth and sixth cervical nerves. Additionally, our findings presented a left-sided unilateral occurrence similar to other documented reports of the muscle. Moreover, our report is the first to report the proximity of the levator claviculae and the spinal accessory nerve in the posterior cervical triangle. We hypothesise that this arrangement may be a potential site of nerve compression between the posterior border of the levator claviculae and the anterior edge of the upper trapezius muscle.

The levator claviculae is an infrequent muscular variant occurring in only a small percentage of the population. Yet, its presence as an anatomical variation does have clinical significance. An awareness of this muscle is important for clinicians, radiologists,

and surgeons to avoid iatrogenic complications from unwarranted imaging studies or even misdiagnosis. The embryological, phylogenetic, and functional significance of this muscle still remains uncertain, but with advancing imaging techniques, some of these issues may soon be determined.

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