Case Report

Levator Claviculae Muscle: Anatomic Variation Found During Neck Dissection

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The levator claviculae muscle is a variant of the anatomy of the posterior triangle of the neck. It is reported in 2% to 3% of all humans. All previous articles described this muscle as an incidental finding during cadaveric or radiological examinations. We report here, for the first time, a case discovering this muscle variation intraoperatively during a modified radical neck dissection. The muscle was identified on the left side, originating from the transverse processes of the upper cervical vertebrae (C2-C3), attached to the upper aspect of the middle part of the clavicle. This muscle was innervated by the supraclavicular nerve, coming from the third and fourth rami of the cervical spinal nerves. Blood supply to the muscle could not be identified clearly during the surgical procedure. Surgeons and radiologists should be aware of the presence of this rare variant muscle so as not to misinterpret the anatomy.

Key Words: Levator claviculae, anatomical variation, neck muscle, cervical mass.

INTRODUCTION

The levator claviculae (LC) is a rare anatomical muscle variant found in the posterior cervical triangle. Its frequency was underestimated before the use of modern radiological examination. The accuracy of computed tomography (CT) and magnetic resonance imaging (MRI) allowed identification of this accessory muscle more easily, with an incidence of 2% to 3% of the population.1,2 LC muscle can arise from one or more transverse processes of the vertebrae from C1 to C6, inserting on the middle or lateral third of the clavicle. The innervation of LC derives from the C2–C5 nerves. The LC is more often unilateral than bilateral. Some authors1,3 reported a left-sided predominance, which remains unconfirmed by others.4,5 The LC muscle is usually found during routine cadaveric neck dissection or radiological diagnosis as an incidental finding.1

To our knowledge, the LC muscle has never been reported as an intraoperative anatomic variant. We present a case of an LC muscle found during surgery and discuss its clinical impact.

CASE REPORT

A 61-year-old man affected by squamous cell carcinoma of the oropharynx (base of the tongue extended to the left tonsillar fossa), staged as cT4aN2c-G2, human papillomavirus HPV positive, was treated with concurrent chemoradiotherapy (total dose of 70 Gy+ cisplatin 30 mg/wk for 6 weeks). Positron emission tomography-CT–guided surveillance, performed after 12 weeks of the treatment showed intense 18F-fluorodeoxyglucose uptake of lymph nodes of level II on both sides, suspicious for incomplete nodal responses after primary treatment. Clinical stage was ycT0N2c.

A bilateral neck dissection (levels II–V) was performed, and a LC muscle was found on the left side (Fig. 1). The LC muscle was lateral to the scalene muscles, anterior to the trapezius and levator scapulae muscles, and medial to the sternocleidomastoid muscle. The LC muscle originated from the transverse process of the C2-C3 vertebrae, in accordance with what is reported in the literature. The LC was innervated by a small branch arising from the medial supraclavicular nerve, which entered the surface of the muscle at its middle third (Fig. 2). The insertion of the muscle was on the middle third of the clavicle. We could not clearly identify any arterial supply to this muscle. The presence of this anatomic variant did not constitute an obstacle for the lymph node neck dissection nor for the identification of important anatomic structures such as the spinal nerve.

DISCUSSION

The LC represents a rare cervical accessory muscle in the posterior triangle of the neck. In the study based on the 300 CT scan imaging by Rubinstein et al., the...
The prevalence of the LC muscle was 2%. Different nomenclatures have been proposed for this rare muscle: cleidocervicalis, or cleidoatlanticus, or cleidotrachelian muscle. This definition variability reflects the different type of origin or insertion of this rare muscle described in literature.

When the LC muscle is present only on one side, it seems to be more frequent on the left side, as observed in our case. A recent review considered the anatomical variability of LC muscle origin, and reported that it can originate at the level of one or more transverse processes of the cervical vertebrae, between C1 and C6. From its origin, the LC muscle runs inferiorly, coursing laterally to the scalene muscles and medial to the sternocleidomastoid muscle. The clavicle represents the constant insertion of the muscle, with the possibility to find the point of insertion at level of the medial, middle, or lateral portion of the clavicle. In the present case, it originated from the transverse process of the C2-C3 vertebrae, even if an origin at the level of C1-C2 cannot be excluded, because we did not skeletonize the transverse processes of the upper cervical vertebrae during surgery so as not to injure anatomic structures that did not require any dissection. The point of insertion was found at the level of the middle portion of the clavicle, as reported in the literature. The pattern of innervation of the LC is still unclear; nevertheless, the anterior branches of the cervical plexus seem to guarantee nerve supply of the muscle. In the present case, the LC muscle was innervated by a short branch of the medial supraclavicular nerve, a ventral ramus of the C2-C3 spinal nerves. A similar pattern of innervation of the LC muscle was already described by Rodriguez-Vazquez. We also observed that the cervical and the dorsal parts of the trapezius muscle were partially separated. Although this anomaly is occasionally encountered, it is not associated with the presence of the LC muscle.

The embryological origin of the LC muscle is controversial. Odate et al. reviewed the literature, reporting different theories on the embryological origin of the LC muscle having the same or similar development as sternocleidomastoid, trapezius, anterior scalene, or longus colli muscles.

Compared to previous articles reported in the literature, where the LC was found during cadaver dissection, in our case it was identified during a surgical procedure. This aspect represented a limit in performing a more accurate dissection of the muscle and surrounding structures to avoid excessive injury and unnecessary damage to the patient.

The function of LC muscle is in the elevation of the clavicle and lateral flexion of the neck. The presence of this accessory muscle is usually discovered by the radiologist as an incidental finding. It appears as a shadow of soft tissue in the posterior triangle of the neck in CT imaging and MRI. Differential diagnosis should always be considered in the LC muscle and cyst, lymphadenopathy, metastatic lymph nodes, or neoplasm. The presence of synchronous enlarged lymph nodes may explain the misinterpretation in diagnostic error with the risk of overstaging and/or overtreatment.

The presence of the LC muscle is usually asymptomatic for the patient; however, a case of thoracic outlet syndrome for neurovascular compression at the root of the upper limb has been described. The patient affected by the LC muscle was found in the left posterior triangle of the neck, and its insertion was in the middle of the clavicle (CL). The LC was located deeper to the sternocleidomastoid muscle (SCM), lateral to the internal jugular vein (IJV) and to the anterior (aS) and the middle (mS) scalene muscles, anterior to the cervical part of trapezious muscle (cT). The cervical and dorsal (dT) parts of the trapezius muscle were partially separated. The supraclavicular nerve (*) and spinal nerve (sn) were also shown. The fibro-adipose tissue of the neck dissection (ND) and the SCM were medially retracted in the picture.

Fig. 1. The levator claviculae (LC) was found in the left posterior triangle of the neck, and its insertion was in the middle of the clavicle (CL). The LC was located deeper to the sternocleidomastoid muscle (SCM), lateral to the internal jugular vein (IJV) and to the anterior (aS) and the middle (mS) scalene muscles, anterior to the cervical part of trapezious muscle (cT). The cervical and dorsal (dT) parts of the trapezius muscle were partially separated. The supraclavicular nerve (*) and spinal nerve (sn) were also shown. The fibro-adipose tissue of the neck dissection (ND) and the SCM were medially retracted in the picture.

Fig. 2. Drawing of Figure 1, which clarifies the origin of the levator claviculae (LC) from the transverse process of the C2-C3 vertebrae (C2, C3), represented in transparency. Moreover, this panel emphasizes the innervation branch of the supraclavicular nerve (*) for the LC. The sternocleidomastoid muscle (SCM); internal jugular vein (IJV); anterior (aS), middle (mS), and posterior (pS) scalene muscles; spinal nerve (sn); cervical (cT); and dorsal (dT) parts of the trapezius muscle. CL = clavicle.
this syndrome in the presence of the LC muscle reported pain, numbness, and other symptoms of nerve compression. More recently, Billings and Sherill described an anatomical variant of the LC muscle, with the supraclavicular nerve crossing deep into the LC during a cadaver dissection. He hypothesized that the nerve entrapment or compression by the muscle may justify some cases of shoulder pain in vivo.

CONCLUSION
Awareness of this accessory muscle at the level of the posterior cervical triangle is not only interesting to anatomists, but also to radiologists and head and neck surgeons. The presence of this muscle should be considered in cases of asymptomatic swelling or eventual shoulder pain in the supraclavicular region of the neck.

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BIBLIOGRAPHY