SHORT REPORT

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Supernumerary cleidocervicalis (levator claviculae) muscle: case report of its rare incidence with clinical and embryological significance

S. Koshy, S. Rabi and I. Indrasingh

Department of Anatomy, Christian Medical College, Vellore, India

SUMMARY

During routine dissection by medical students at the Department of Anatomy of the posterior triangle of the neck of a South Indian muscular male cadaver, aged 67 years, a variant of the rare supernumerary cleidocervicalis muscle was found bilaterally. This muscle arose from the transverse processes of the atlas and axis. It terminated by inserting into the posterior aspect of the lateral third of the clavicle, merging with the anterior fibres of the trapezius muscle. It was innervated by branches from the second, third, and fourth cervical nerves. No variation was noted in the other muscles in this region. The present report addresses another variant of the cleidocervicalis muscle with a combination of origin, insertion, and nerve supply different from most previous reports. The aim of the present case report is to highlight its clinical significance to physicians, surgeons, and radiologists in order to differentiate it from other soft tissue lesions, together with its embryological significance to anatomists.

Key words: Cleidocervicalis muscle – Levator claviculae muscle – Soft-tissue lesion – Supernumerary muscle

INTRODUCTION

The cleidocervicalis or levator claviculae is a supernumerary muscle situated in the posterior triangle of the neck (Kelch, 1813; Gruber, 1876; Nagashima et al., 1989; Tomo et al., 1994; Leon et al., 1995). Its incidence is reported to be 2-3% (Wood, 1869; Macalister, 1875; Gruber, 1876; Testut, 1894; Le Double, 1897; Rubinstein et al., 1999). Variants of this muscle have been described as having different combinations of origins, ranging from transverse processes of the cervical vertebrae to insertions to the clavicle, the nerve supply, and sidedness: an origin from the transverse process of the sixth cervical (Tomo et al., 1994; Rosenheimer et al., 2000), first cervical (Leon et al., 1995), or first and second cervical vertebrae (Holibkova and Machalek, 1998), or the upper part of the cervical vertebral column (Fasel et al., 1994; Rubinstein et al., 1999); insertion into the superior margin (Tomo et al., 1994), the posterior aspect of middle third (Leon et al.,, 1995; Rubinstein et al., 1999), or the lateral third (Holibkova and Machalek, 1998; Rubinstein et al., 1999) of the clavicle, nerve supply from the fifth (Tomo et al., 1994), fourth (Leon et al., 1995), or second to fourth (Holibkova and Machalek, 1998) cervical nerves; and location unilaterally on the left-side (Tomo et al., 1994; Rudisuli, 1995; Fasel et al., 1994; Rubinstein et al., 1999; Shaw and Connor, 2004), unilaterally on the right-side (Leon et al., 1995; Rubinstein et al., 1999), or bilaterally (Nagashima et al., 1989; Rubinstein et al., 1999). A cleidocervicalis muscle has not been reported in Indian subjects. The aim of the present case report on the cleidocervicalis muscle is to highlight its clinical significance to physicians, surgeons, and radiologists in order to differentiate it from other soft tissue lesions, together with its embryological significance for anatomists.

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Correspondence to:
Dr. Shajan Koshy. Department of Anatomy, Christian Medical College, Vellore 632 002, India.
Phone: 0416 - 2284245 / Fax: 0091 - 416 - 2262788. E-mail: shajank@hotmail.com

Results

During routine dissection of the posterior triangle of the neck by medical students at the Department of Anatomy on a 67-year old South Indian muscular male cadaver, a variant of the rare supernumerary cleidocervicalis muscle (Fig. 1) was found bilaterally. This muscle had a cylindrical belly and measured 12.5 x 2.4 cm. The muscle arose by a rounded tendon from the transverse processes of the atlas and axis. The muscle ran parallel to the origin of the levator scapulae. It terminated by inserting into the posterior aspect of the lateral third of the clavicle, merging with the anterior fibres of the trapezius muscle. The upper third of this cleidocervicalis muscle was covered by the sternocleidomastoid. It was superficial to the omohyoid, scalenus anterior, and scalenus medius muscles. It had its own fascial sheath, derived from the deep cervical fascia. The internal jugular vein was deep to the belly of the cleidocervicalis muscle. In the lower part, the muscle was superficial to the superficial cervical and suprascapular arteries, phrenic nerve, and ventral branches from the second, third, and fourth cervical nerves before they formed the large auricular, transverse cervical and supraclavicular nerves. The cleidocervicalis muscle was innervated by branches from the second, third, and fourth cervical nerves (Fig. 2): the upper third of the muscle by branches directly from the roots of the anterior rami of second and third cervical nerves, and the lower two thirds by branches from the loop between the third and fourth cervical nerves. No variation was noted with the other muscles in this region.

Discussion

The cleidocervicalis (levator claviculae) muscle is a supernumerary (i.e., more than the usual, extra) muscle in the posterior triangle of the neck. It is a vestigial muscle and is an infrequently recognized variant in humans. It is a relatively uncommon and little reported normal variant. Variants of this muscle have been reported. The present report describes another variant of the cleidocervicalis muscle with a combination of origin, insertion, and nerve supply different from most previous reports but closely resembling that of Holibkova and Machalek (1998).

The unexpected rare incidence of the cleidocervicalis muscle is of clinical significance. It can present as a hard mass in the clavicular area associated with an angular deformity of the clavicle (Santiago et al., 2001). During routine physical examination, a palpable soft tissue was observed and with further imaging techniques it was identified as the cleidocervicalis muscle. This observation underscores the importance of understanding soft tissue variants (Rosenheimer et al., 2000). An unusual variant of the cleidocervicalis muscle was encountered during exploratory surgery of the brachial plexus (O'Sullivan and Kay, 1998). When this muscle is encountered during explorations in the posterior triangle, it may be safely resected since it is vestigial. The cleidocervicalis muscle has been identified on CT scans, which presented clinically as head and neck cancer or multiple enlarged lymph nodes (Rudisuli, 1995). A soft tissue shadow seen during routine radiological examination can be identified as a cleidocervicalis muscle by three-dimensional reconstruction, and hence reinforces the significance of identifying muscular variants by modern imaging techniques (Fasel et al., 1994). Multiplanar reformation of a mimicked cervical lymph node enlargement at preoperative axial computed tomography was confirmed as the muscle, which had a shape ranging from rounded to linear, changing shape along its length. Radiologically, it may be confused with lymphadenopathy, leading to inappropriate management (Shaw and Connor, 2004). The importance of the cleidocervicalis muscle to radiologists lies in distinguishing it from an abnormality; most commonly cervical adenopathy using CT scans (Rubinstein et al., 1999). A posterior cervical space mass was identified on CT as a cleidocervicalis muscle. Radiologists are thus cautioned to become familiar with the cleidocervicalis muscle and its appearance in order to avoid misdiagnosing it as pathologic (Ginsberg and Eicher, 1999). Since the cleidocervicalis muscle is situated superficially in the posterior triangle of the neck, it overlies a number of small arteries and nerves. It may therefore press on any of these structures and cause compression syndromes.

The cleidocervicalis muscle has more embryological than functional significance. It appears regularly in the neck of all anthropoid apes (Testut, 1894; Le Double, 1897) and most other mammals (Parsons, 1898; Aiello and Dean, 1990; Rubinstein et al., 1999) but has been lost in modern man. It is considered to have originated from the scalene muscles (Kelch, 1813; Gruber, 1876), sternocleidomastoid (Wood, 1869), trapezius (Parsons, 1898), both of which develop from the material of post-branchial arches (caudal division of the branchiogenic muscles) and cervical somites (Lewis, 1910; McKenzie, 1962; Holibkova and Machalek, 1998), both the inferior hyoid and sternocleidomastoid muscles (Nagashima et al., 1989), scalenus anterior, longus capitis, or the longus coli, most likely the longus coli (Tomo et al., 1994). The embryological origin of the cleidocervicalis muscle is possibly from the ventrolateral muscle primordia of the neck, which in addition to contributing to the formation of the anterior vertebral, hyoid, and scalene muscles (Lewis, 1910; Arey, 1965), also contribute to the formation of a new muscle with an 'atavistic' character through a

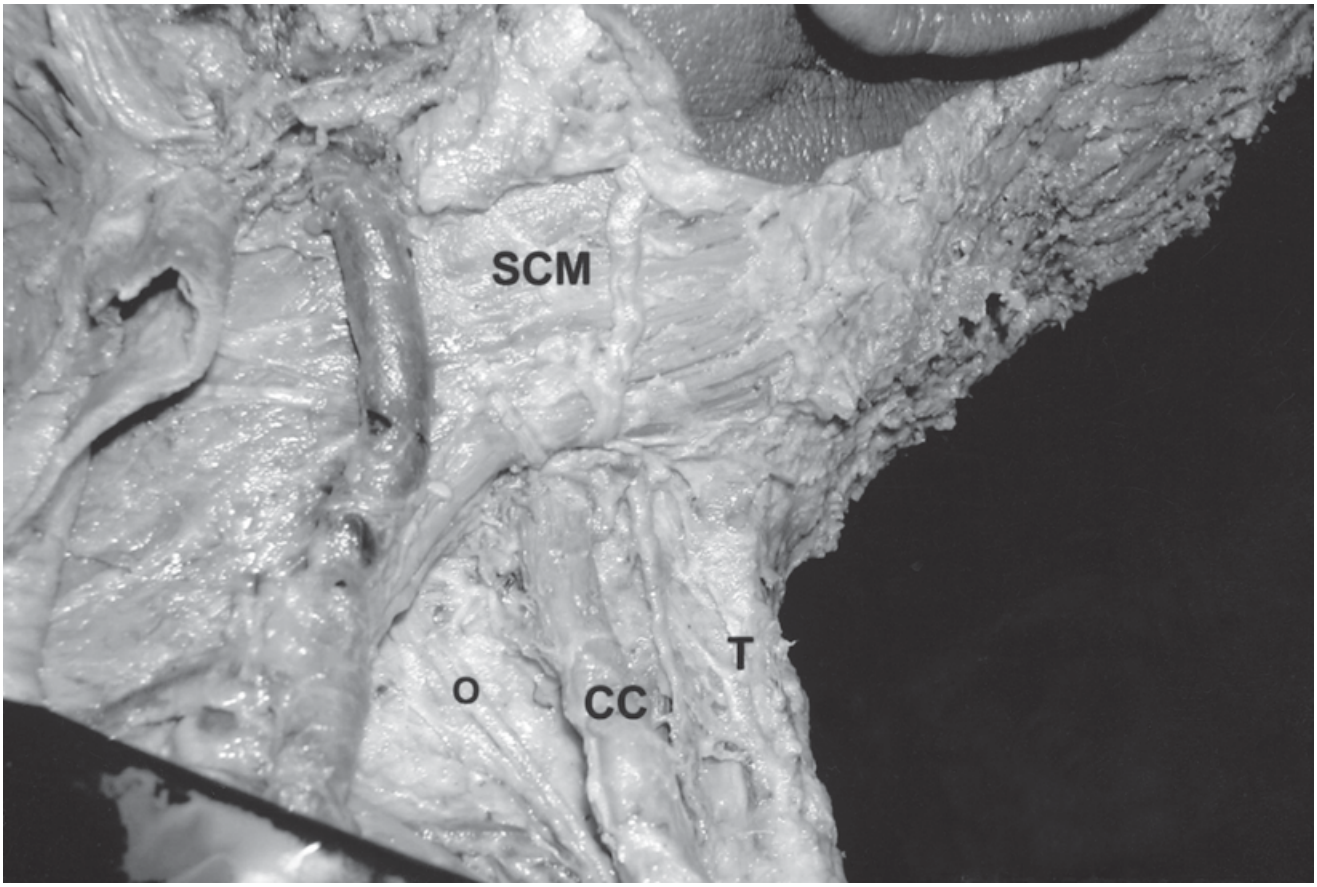

Fig. 1.- Cleidocervicalis muscle in the left posterior triangle of the neck. SCM - Sternoleidomastod muscle; T - Trapezius muscle; CC - CLeidocervicalis muscle; o - Omohyoid muscle.

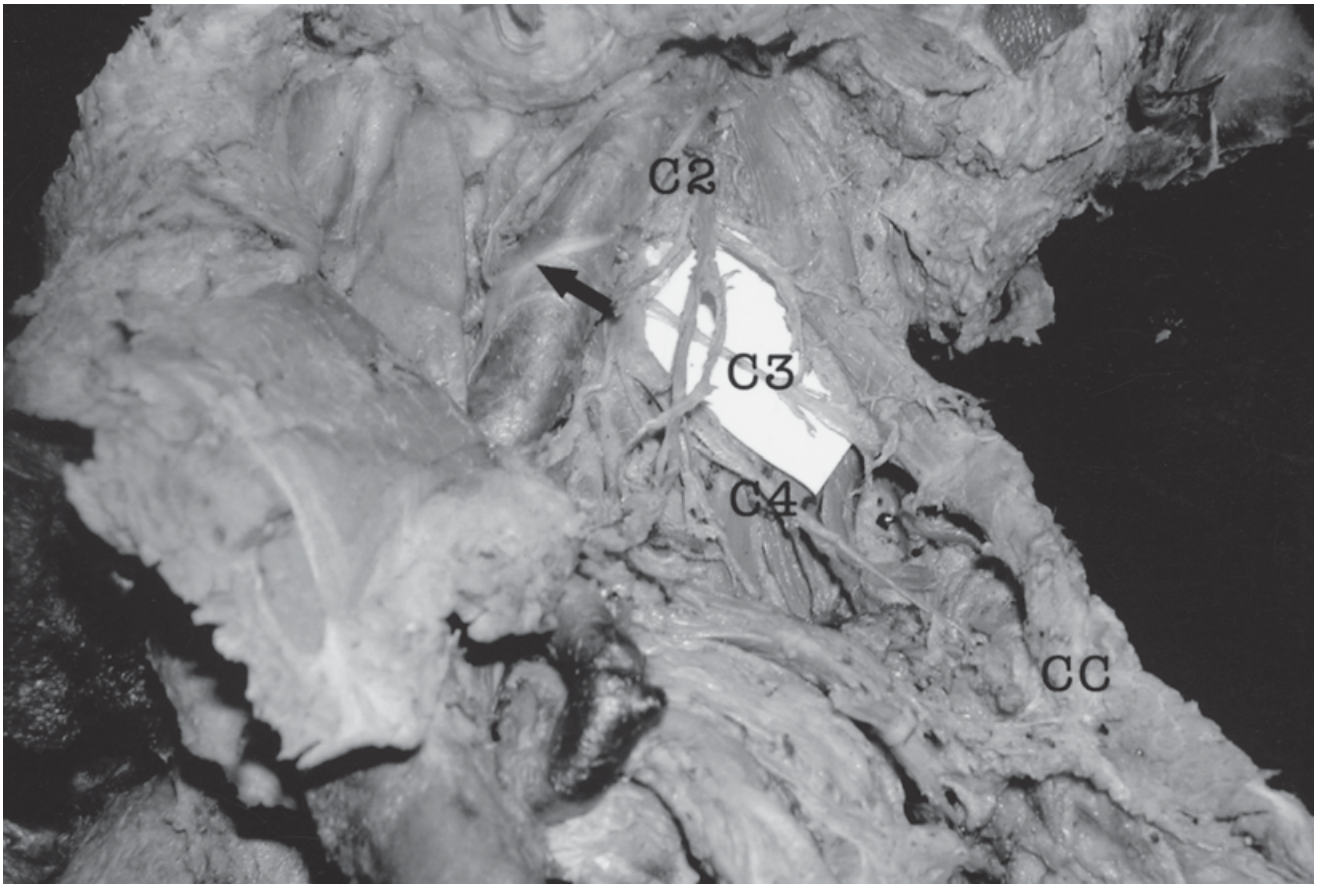

Fig. 2.- Innervation of the cleidocervicalis muscle. Thick arrow - ansa cervicalis; CC - cleidocervicalis muscle; C2, C3 and C4 - Branches from second, third, and fourth cervical nerves.

migration mechanism of the most superficial and cranial cells towards the clavicle. This recent hypothesis would account for its attachments and superficial position in relation to the omohyoid and associated neurovascular structures (Leon et al., 1995). In the present case, the origin from the transverse processes of atlas and axis, its superficial position in the posterior triangle of the neck, and its nerve supply from the anterior rami of the second, third, and fourth cervical nerves suggest that it would develop from the ventrolateral muscle primordia of the neck or cervical myotomes. In erect bipedal animals with a vertical body axis, the scalene muscles are helpful to support and elevate the thorax and to assist thoracic respiration against gravity (Inuzuka, 1989). Therefore, the role of the scalene muscles would have been demanding and it is likely that scalenus anterior developed during the process of evolution of bipeds from tetrapods, from the longus coli (Nishi, 1938) to fulfill these functions. It is assumed that cleidocervicalis also originated for similar functional reasons from the longus coli (Tomo et al., 1994). The cleidocervicalis has the same functions and insertion as the sternocleidomastoid (Williams and Warwick, 1989) and same functions as scalenus anterior (Mori and Outi, 1982).

Thus, having lost its functional significance the cleidocervicalis has disappeared. The erect bipedal nature of man and scalene muscles being used for assisted thoracic respiration, the cleidocervicalis, if present, is vestigial and could be a clinical muscular variant.

References

Aiello L and Dean C (1990). An Introduction to Human Evolutionary Anatomy. Academic Press, London, pp 210-231.

Arey LB (1955). Developmental Anatomy. A Textbook and Laboratory Manual of Embryology. W.B. Saunders, Philadelphia, pp 426-438.

Fasel J, Gailloud P and Terrier F (1994). Three-dimensional reconstruction of a levator claviulae muscle. *Surg Radiol Anat,* 16: 303-305.

Ginsberg LE and Eicher SA (1999). Levator claviculae muscle presenting as a neck mass: CT imaging. *J Comput Assist Tomogr,* 23: 538-539.

Gruber W (1876). Ein Musculus cleido-cervicalis trachelo-clavicularis imus. In: *Archiv fur anatomissche, physiologische und wissenschaftliche Medizin,* pp 757-758.

Holibkova A and Machalek L (1998). A contribution to the anomalies of heterochtonic back muscles. *Acta Univ Palacki Olomuc Fac Med,* 141: 53-55.

Inuzuka N (1989). A case of the scalenus anterior muscle passing behind the left subclavian artery. *Okajimas Folia Anatomica Japonica,* 66: 229-240.

Kelch WG (1813). Cited in Gruber (1876).

Leon X, Maranillo E, Quer M and Sanudo JR (1995). Case report: cleido cervical or levator claviculae muscle. A new embryological explanation as to its origin. *J Anat,* 187: 503-504.

Le Double AF (1897). *Traite des Variations du Systeme Musculaire de l' Homme et de leur Signification au Point de Vue de l' Anthropologie Zoologique,* Vol. 2. Librarie C. Reinwald, Schleicher Frares, Paris, pp 215-240.

Lewis WH (1910). The development of muscular system. In: Kaibel F, Mall FB (eds). *Manual of Embryology.* Vol. 2. J.B. Lippincott, Philadelphia, pp 455-522.

Mckenzie J (1962). The development of the sternomastoid and trapezius muscles. *Contributions to Embryology,* Carnegei Institute, 37: 123-129.

Mori O and Outi H (1982). *Anatomy.* Kanehara, Tokio, p 394.

Nishi S (1938). Muskeln des Rumpfes. In: Bolk L, Gopprt E (eds). *Handbuch der vergleichenden Anatomie der Wirbeltiere.* Vol. 5. Urban & Lubosch, Berlin, Vienna, pp 351-419.

O'Sullivan ST and Kay SP (1998). An unusual variant of the levator claviculae muscle encountered in exploration of the brachial plexus. *J Hand Surg,* 23: 134-135.

Parsons FG (1898). The muscles of mammals with special relations to human myology. *J Anat,* 32: 428-450.

Rosenheimer JL, Loewy J and Lozanoff S (2000). Levator claviculae muscle discovered during physical examination for cervical lymphadenopathy. *Clin Anat,* 13: 298-301.

Rubinstein D, Escott EJ and Hendbrick LL (1999). The prevalence and CT appearance of the levator claviculae muscle: a normal variant not to be mistaken for an abnormality. *Am J Neuroradiol,* 20: 583-586.

Rudisuli T (1995). Demonstration of a musculus levator claviculae. *Surg Radiol Anat,* 187: 503-504.

Santiago RF, Milena LG, Santos CC and Fernandez TJM (2001). Levator claviculae muscle presenting as a hard clavicular mass: imaging study. *Eur Radiol,* 11: 2561-2563.

Shaw AS and Connor SEJ (2004). Unilateral levator claviculae muscle mimicking cervical lymph node enlargement in a patient with ameloblastoma. *Dentomaxillofacial Radiol,* 33: 206-207.

Tomo S, Toh H, Hirakawa T, Tomo I and Kobayashi S (1994). Case report: the cleidocervical muscle with speculations to its origin. *J Anat,* 184: 165-169.

Testut L (1894). *Traite d'Anomalies Musculaires chez l' home.* Masson, Paris, pp 97-106.

Williams PL and Warwick R (1989). *Gray's Anatomy.* 37th Edit. Churchill Livingstone, London, p 584.

Wood J (1869). On groups of varieties of the muscles of the human neck, shoulder, and chest with their transitional form and homologies in the mammalia. *Proceed Royal Soc London,* 18 B: 1-3.