



Unilateral Abnormalities of the Anterior Neck Musculature: A Case Report

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- Received Date: 11 Jan 2025
- Accepted Date: 19 Jan 2025
- Publication Date: 23 Jan 2025

Keywords

Infrahyoid; Anatomical Variation ; Sternohyoid; Sternothyroid; Omohyoid

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Abstract

During cadaveric dissections for first-year medical students, an additional muscle was found on the anterior neck lateral to the sternohyoid muscle on the left side of the cadaver. After further dissection, it was discovered that this abnormality was isolated and was unilateral in nature. To our knowledge, the present study is the first to report such a unilateral variant although other infrahyoid muscle variants have been noted. This cadaver was a 65-year-old Caucasian male and had been donated to the university for education and research purposes. This variant contributes to the existing knowledge of anatomical abnormalities regarding the neck muscles. This is especially important as many of these neck muscles serve as landmarks for surgery and treatment.

Introduction

The infrahyoid muscles are a collection of muscles between the hyoid bone and thyroid cartilage, including the sternohyoid, omohyoid, sternothyroid, and thyrohyoid muscles [1]. They collectively assist with swallowing, chewing, and speech [1]. Among them, the omohyoid muscle is particularly significant in clinical practice serving as an important landmark in neck dissections by delineating the anterior and posterior cervical triangles [2].

Anatomical variations of the infrahyoid muscles, especially the omohyoid, have been frequently reported in the literature [1]. Typically, the omohyoid muscle spans between the clavicle and hyoid bones, comprised of two muscle bellies separated by an intermediate tendon [2]. However, variations in this muscle, such as additional or absent bellies, shortened bellies, or other morphological changes, have been documented [1]. For example, Verma et al. [3] described a variant termed the 'cleidohyoid,' originating from the right clavicle and inserting into the ipsilateral hyoid bone. Duplicated omohyoid muscles, which can complicate surgical approaches and clinical assessments, have also been observed [4,5].

The sternohyoid muscle is another member of the infrahyoid group that can exhibit variant forms, such as duplication, absence, or an altered attachment to the sternum [1]. While it generally originates from the manubrium and medial clavicle and inserts into the inferior margin of the hyoid bone, Mazurek et al. [6] identified a variant muscle

band connecting the right hyoid bone to the contralateral sternothyroid muscle.

Additionally, variations of the cleidohyoid muscle have been well-documented, including the omo-cleidohyoideus, cleido-hyoideus, cleido-sterno-hyoideus, and cleido-hyoideus accessorius [7,8]. The cleidohyoideus accessorius, a relatively rare variant, is an accessory muscle connecting the clavicle and hyoid bones in the presence of a normal omohyoid muscle [7]. This accessory muscle may present with multiple attachments to the clavicle and hyoid bones, further adding to its variability [7].

Occasionally, accessory neck muscles can be identified alongside the usual infrahyoid muscles. For instance, Nayak & Shetty discovered a bilateral muscle located between the sternohyoid and superior belly of the omohyoid originating from the sternoclavicular joint and posterior medial clavicle and inserting into the hyoid bone [1]. Similarly, Hatipoğlu et al. reported a case of the 'cleido-hyoideus muscle,' an additional muscle running adjacent to the intermediate tendon of the omohyoid and joining it at the hyoid insertion point, unilaterally on the left side [2].

Given their surgical significance, variations in infrahyoid muscle anatomy have been the focus of numerous studies. In neck cancer therapy, the omohyoid serves as a critical landmark for identifying levels III and IV lymph node metastases [5]. Additionally, it is a key landmark in endoscopic procedures exploring the brachial plexus [2]. Therefore, understanding and documenting new variants

Citation: Luo T, Patel S, Swerdlow S, et al. Unilateral Abnormalities of the Anterior Neck Musculature: A Case Report. Case Rep Rev. 2025;5(1):03.

is crucial, as these anomalies can impact surgical planning, clinical assessments, and patient outcomes.

In this report, we present a unique case of an additional muscle identified on the anterior neck, lateral to the sternohyoid muscle, observed during cadaveric dissection of a 65-year-old Caucasian male. This finding contributes to the existing knowledge of anatomical variations in the infrahyoid muscle group and underscores the importance of recognizing such anomalies in clinical practice.

Case Report

This cadaver was for a Caucasian male, age 65, and purchased by California Northstate University, College of Medicine from the University of California, Davis, Willd Body Program for the purpose of medical education and research. During cadaveric dissection of the anterior neck, typical anatomy was noted



Figure 1. View of the anterior neck musculature, front view.
S = Sternohyoid, OM = Omohyoid, SCM = Sternocleidomastoid,
CCA = Common Carotid Artery, P = Platysma

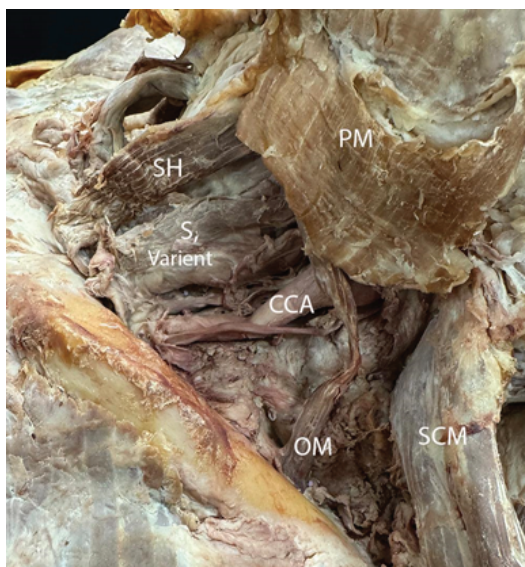


Figure 2. View of anterior neck musculature left side view.
SH = Sternohyoid, OM = Omohyoid, SCM = Sternocleidomastoid,
CCA = Common Carotid Artery, PM = Platysma

with the addition of an atypical, new deep anterior accessory muscle on the left side of the neck. After the surrounding fascia was removed, leaving the musculature intact, the atypical musculature was noted and logged. This additional, unilateral muscle originated from the medial aspect of the clavicle bone and inserted to the hyoid bone. This is similar to the origin and insertion of the sternohyoid muscle [9] which was present medially to this variant muscle. However, the identified variant is located parallel, lateral, and slightly deep to the sternohyoid muscle. Interestingly, the omohyoid and sternohyoid muscles are of the same plane, while our variant arises beneath this plane. There were no other variants in the neck musculature to surrounding vasculature, and the variant musculature is shown in Figures 1-3. The clinical data of the patient did not report any clinical findings related to this abnormality.

Photographs of the sternohyoid variant (Figures 1-3) taken after reflecting platysma superiorly and sternocleidomastoid superiorly and laterally. The traditional layered dissection of the anterior neck musculature revealed abnormal musculature in the superficial muscular layer of the anterior neck after reflecting platysma to its insertion at the mandible and sternocleidomastoid from its origin on the sternum and clavicle to its insertion on the mastoid process.

Discussion

Recognizing expected variants remains important to avoid mistaking the extra structures for pathological abnormality and to build potential for creative usage of the muscles. Medical providers should not fear the variance as a layer of difficulty of the operation that predisposes them to surgical errors. However, based on our research of existing literature, a similar variant was discovered in Nayak and Shetty's case report. Unlike the variant identified by Nayak and Shetty, which was bilateral, symmetric, and in a superior plane, the "sternocleidohyoid" variant is unilateral in nature, smaller in size, and homologous to the sternohyoid. Additionally, the identified variant is located lateral and slightly deep to the sternohyoid muscle. It comprises its own standalone plane beneath the superior plane of sternohyoid and omohyoid muscle, but above the thyrohyoid

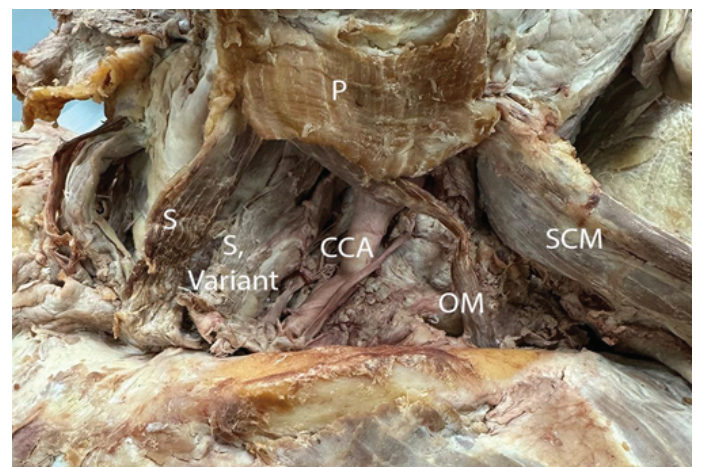


Figure 3. View of anterior neck musculature, reoriented side view of left neck musculature.
S = Sternohyoid, OM = Omohyoid, SCM = Sternocleidomastoid,
CCA = Common Carotid Artery, P = Platysma

and sternothyroid layer — only a fascia layer away from the cartilages.

Kang, Byeon, and Yoon identified a variant in the same geographic location as the “sternocleidohyoid variant” [10]. Kang et al. discovered an additional accessory belly arising from the right sternothyroid muscle with attachments to both the posterior surface of the left sternothyroid muscle and pretracheal layer of the cervical fascia [10]. Unlike this finding, our variant does not cross the midline or separate to attach to various sites. Rather, our muscle originates and inserts directly into bones. Many of the infrahyoid variants discovered are different in both composition and presentation, providing huge assets to medical providers when determining effective surgical approaches.

Proper identification and reporting of anatomical variations as they arise are valuable assets for both the scientific world and the clinical community. Anatomical landmarks are commonly utilized by surgeons to orient themselves and prevent intraoperative complications. The neck is broadly divided into the anterior and posterior triangles, with the medial and lateral margins of sternocleidomastoid muscle (SCM) separating and outlining each [11]. Within the anterior triangle, we can find the infrahyoid muscles within the “muscular triangle” division. The midline of the neck from the hyoid bone to the sternum, where all infrahyoid muscles insert into, the anterior margin of the SCM and the superior belly of the omohyoid muscle respectively make up the anterior, inferior, and superior borders of this triangle.

Invasive surgeries like tracheostomy performed for acute respiratory failure [12,13] and thyroidectomy, the most preferred management approach for thyroid carcinoma [14] are two widely employed invasive surgeries that access this triangle [6]. One complication of thyroidectomy is hoarseness, due to injury of the recurrent laryngeal nerve [15]. Given their medial, superficial positions, deeper structures such as the thyroid gland, trachea, and internal jugular vein can be reached when infrahyoid muscles are retracted or incised [16]. The internal jugular vein is the commonly used site for central venous catheterization [17], a procedure that establishes long-term venous access and revolutionized patient care [18].

Infrahyoid muscles serve as a useful reference point when learning about neck anatomy to reduce surgical injuries and enhance the efficacy of surgical dissections. This identification, however, becomes more complicated when anatomical variations such as the one we identified arise. Anatomical variations inside the triangles pose higher risk of operative errors. Complications related to aforementioned procedures range from impingement of laryngeal nerves, causing voice change [19], to deep vein thrombosis, hemorrhage and loss of airway [20-22]. On a more positive note, additional muscles are also strong candidates as autologous muscle grafts [23]. They are perfect materials to restore defects of other areas while preserving the original function of the neck and minimizing immunogenic rejection.

Proper consideration of strap muscle variants is essential to adequately determine surgical landmarks for surgeries such as thyroidectomy, parathyroidectomy, laryngectomy, cervical spine surgery, branchial cleft cyst excision, and tracheostomies. Thorough knowledge of different muscle compositions is crucial to achieve ideal surgical outcomes, minimize complications, and ensure patient safety and post-operative recovery.

Conclusion

Upon routine cadaveric dissection of a 65-year-old Caucasian male, a unilateral left-sided variant was discovered on the anterior neck just lateral to the sternohyoid muscle with identical origin and insertion to the sternohyoid muscle. Knowledge of neck muscle variants will further aid physicians in avoiding complications and obstacles as well as providing precise and deliberate care.

Compliance With Ethical Standards

Conflict of Interest: none

Contributions: all authors have an equal contribution to finalize this work

Acknowledgment

The authors wish to thank individuals who donate their bodies and tissues for the advancement of education and research.

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