CASE REPORT
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An Unusual Variation of the Omohyoid Muscle with Surgical Implications and Review of the Literature

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Abstract

The omohyoid muscle is an essential surgical landmark in cervical dissection since it separates cervical areas and is closely related to the neurovascular bundle of the neck and brachial plexus.

We present the omohyoid muscle variation, poorly described in the literature, and concisely review other already known anatomical variations.

We present the case of a 30-year-old woman with an oral squamous cell carcinoma staged as cT3N0M0.

She was submitted to a subtotal glossectomy via pull-through approach and bilateral neck dissection. The defect was reconstructed using an anterolateral thigh free flap.

During the neck dissection, we noticed a unilateral anatomical variation of the omohyoid muscle that passed deep to the internal jugular vein, maintaining the remaining path and insertions as traditionally described.

A knowledge of the variations of the omohyoid muscle is important to the head and neck surgeon, considering its relationship with various noble structures of the neck, serving as a reference in various surgical procedures. We report this case of a variation deeper to the internal jugular vein to alert to a potential hazard during neck dissection and to contribute to the literature about omohyoid variations.

Keywords: Anatomical variations, infrahyoid muscles, internal jugular vein, intraoperative, complications, neck, surgery

INTRODUCTION

The omohyoid muscle is a thin, curvilinear, and long muscle that crosses the anterior and posterior triangle of the neck, consisting of an upper and lower belly, joined by an intermediate tendon.[1] It is a very important surgical reference in cervical dissection since it separates cervical areas III[2] and has relationships with major vessels[3] and brachial plexus.[4] Thus, knowledge of the possible variations is recommended.[5]

We present an unusual variation of the omohyoid muscle with possible severe complications during surgical dissection as well as revisions of other anatomical variations already known.

This case report was prepared following the CARE guidelines.[6]

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Table 1. Timeline

Date	Summary From Visits	Diagnostic Testing	Interventions
February 2021	Ulcered painful tongue lesion without neck and other subsite involvement	Computed tomography (CT) scan	Core biopsy
February 2021	Biopsy result: squamous cell carcinoma Neck CT scan: negative		
February 2021	Tumor Board discussion		
March 2021			Surgery: subtotal glossectomy via pull-through approach (Figure 1A and B) and bilateral neck dissection with an anterolateral thigh free flap reconstruction (Figure 1C and D)

CASE PRESENTATION

We present the case of a 30-year-old woman (for timeline, see Table 1) with an oral squamous cell carcinoma (left lateral border of the tongue, with extension to the posterior surface and middle line of the tongue) diagnosed by core biopsy, staged as cT3N0M0, and no known oncological risk factors.

The patient was submitted to a subtotal glossectomy via a pull-through approach (Figure 1A and B) and bilateral neck dissection. The defect was reconstructed using an anterolateral thigh (ALT) free flap (Figure 1C and D).

During the neck dissection, we noticed a unilateral (left side) anatomical variation of the omohyoid muscle that passed deep to the internal jugular vein (Figure 2). The careful intraoperative assessment revealed that other anatomical relationships, including the muscle's course and insertions, were typical. Fortunately, there was no vascular injury during the surgical dissection of the anomalous muscle. Also, the neck dissection of the opposite side revealed normal topographical relations. Further anatomical variations were not found during the procedure.

DISCUSSION

The omohyoid muscle is described in the infrahyoid muscle group,[7] although it differs from the other 3 (sternothyroid, sternohyoid, and thyrohyoid) in its course,[1] for it runs obliquely in the lateral cervical area while the other 3 run vertically in the anterior cervical area. Unlike many other

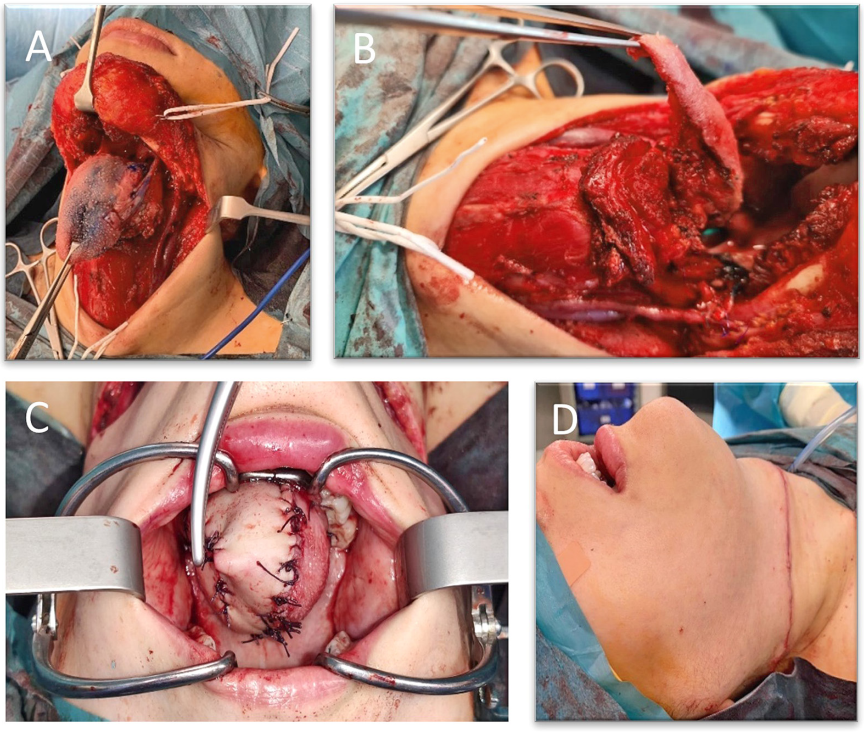

Figure 1. Intraoperative view. (A) Pull-through approach, (B) lateral view of the oral defect, (C) tongue defect reconstructed with ALT free flap, and (D) final cervical defect.

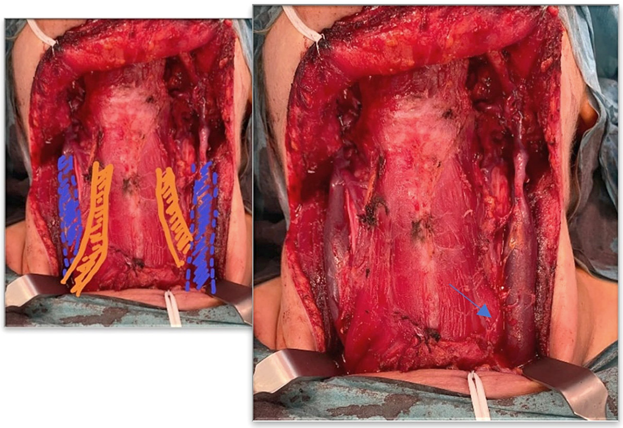

Figure 2 . Anatomical variations of the omohyid muscle. Note the asymmetry in the neck. The arrow points to the muscle passing deep to the internal jugular vein (overlain is a sketched picture for better understanding the omohyoid muscle anatomical variation on the left side).

muscles in the neck (that develop from the branchial arches' mesenchyme), infrahyoid muscles derive from cervical myotomes' myoblasts.[8] This muscle primordium can be further divided into 2 layers: a deep layer that becomes the sternothyroid and thyrohyoid muscles[1] and a superficial layer that is later divided into internal and external portions. The internal muscle becomes the sternohyoid muscle, and the lower part of the external muscle becomes the omohyoid muscle.[9]

The anatomy of the omohyoid muscle as well as the most common variations are described in the literature by several authors.[7-16] Although many variations have been described, the most common anomalies were classified into 5 types by Loth (in 1931)[17] and 6 types by Yamada et al (in 1960).[14]

Loth considered the omohyoid muscles to be a remnant of the sterno-cleido-omohyoid muscle, with 2 portions: the sterno-cleido-hyoid portion and the omohyoid portion. His classification is as follows:

- Type 1: Only cleido-hyoid present.
- Type 2: Cleido-hyoid and omohyoid portions, without a tendinous intersection.
- Type 3: Omohyoid present, but the cleido-hyoid portion is a tendinous sheet.
- Type 4: True omohyoid, without tendinous intersection or cleido-hyoid portion.
- Type 5: True omohyoid muscle, with an intermediate tendon (more common).

Yamada's classification (Figure 3) is as follows:

- Type 1: Absence of omohyoid muscle.
- Type 2: Supernumerary bundles of superior belly or both bellies duplication of whole muscle.
- Type 3: Abnormal pattern of inferior belly.
- Type 4: Cleido-hyoid muscle or accessory cleido-hyoid muscle.
- Type 5: Abnormal pattern of insertion of omohyoid muscle.
- Type 6: Accessory omohyoid muscle.

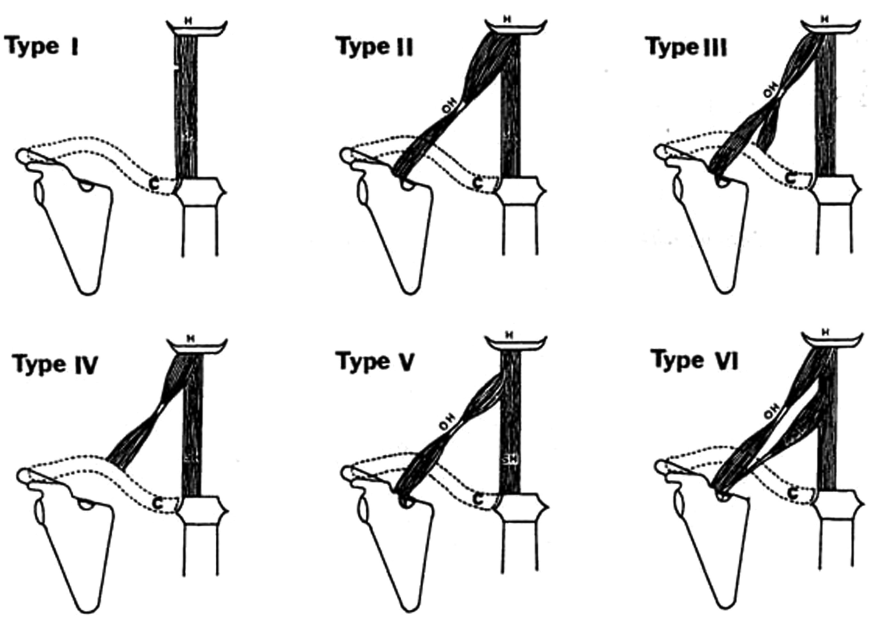

Figure 3. Yamada's classification. Used with permission: https://www.jstage.jst.go.jp/article/ofaj1936/72/2-3/72_81/_article/-char/en

More recently, Rai et al (in 2008) described, after studying 35 cadavers, 4 types of variations, in addition to the most common "normal" one,[1] as stated below:

- Normal: Standard attachments (85%).
- Type 1: Double omohyoid (3%).
- Type 2: Cleido-hyoideus (6%).
- Type 3: Short omohyoid (3%).
- Type 4: Superior belly receiving slips from sternum with normal inferior belly (3%).

Normally, the inferior belly lies superficial to the brachial plexus, phrenic nerve, and transverse cervical artery and vein.[18] The superior belly lies immediately superficial to the internal jugular vein.[19] In this clinical case, the inferior belly lies deep to the internal jugular vein. This very rare variation can be problematic, for this muscle is usually a landmark in cervical surgery, for it is used as a safety barrier for the internal jugular vein. In this case, with this variation, the vein is unsuspectedly exposed over the muscle. During the dissection, the vein can be collapsed (because of tissue traction by the second surgeon, for example) and is not readily seen, and following the superficial face of the muscle when dissecting, the surgeon could transect the vein. This variation is not classifiable in any of the types described in the mentioned literature. It had been the subject of a brief report before.[19]

Anatomical variations and developmental anomalies should always be considered during neck surgeries.[20] It is a common saying that the omohyoid muscle is the best landmark in identifying the internal jugular vein,[1] and therefore this specific variation is important because, although very uncommon, its awareness may avoid potentially serious and fatal complications.

Because of the many variations described, Mizen et al[21] consider the omohyoid as an unreliable surgical landmark and suggest that surgeons stop using it as a reference point in neck surgery, and this is also our mind.

As suggested by Żytkowski et al,[22] the analysis of anatomical variations can contribute to obtaining an actual image of the human body, which is of crucial importance in everyday clinical practice.

CONCLUSION

A knowledge of the variations of the omohyoid muscle is important to the head and neck and oral and maxillofacial surgeons, considering its relationship with various noble structures of the neck, serving as a reference in various surgical procedures. We report this case of a variation deeper to the internal jugular vein to alert to a potential hazard during neck dissection and to contribute to the literature about omohyoid variations.

Informed Consent: Written and verbal informed consent was obtained from the patients who agreed to take part in the study.

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