Anatomy of the Head and Neck: The Infrahyoid Musculature

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The infrahyoid musculature is frequently given little attention in the course of medical education. While medical students get to hear this term at some point during a lecture or come across this musculature at least once during a dissection course, physiotherapists, for example, do not learn about these very important muscles at all and have to get up to speed on this subject via expensive training courses. To prevent misunderstanding it should be mentioned that this group of muscles is also referred to as hyoid musculature in the literature because of its direct osseous connection to the hyoid (tongue bone). Medical students will be pleased to hear all these muscles share the same innervation, which truncates the learning process.

Definition: What is the infrahyoid musculature?

The **infrahyoid (or hyoid) musculature** describes a group of skeletal muscles which originate caudally and insert on the **os hyoideum** (tongue bone), which means that they
are located below (inferior to) the osseous structures. Muscles located above (superior to) the os hyoideum are referred to as **suprahyoid musculature**, which will be the topic of a separate article.

### Classification: Which muscles belong to this group?

Infrahyoid muscles include five muscles: **m. omohyoideus, m. sternohyoideus, m. sternothyroideus, m. thyrohyoideus** and **m. levator glandulae thyroideae**, which is, however, inconstant in humans.

In evolutionary terms, they are assigned to the large ventral longitudinal muscle system. In medical literature the m. omohyoideus also counts as part of the immigrated trunk musculature, which has insertion on the shoulder girdle – due to its osseous origin.

### Musculus omohyoideus

The m. omohyoideus originates, via the **venter inferior**, from the upper edge of the scapula, the **margo superior scapulae**, which is next to the **incisura scapulae**, and the respective **venter superior** inserts on the **lateral third** of the lower edge of the corpus **ossis hyoidei**. Its primary function is to stretch the fascia of the ventral chain of the neck, and in a broader sense it is also the vascular muscle of the **vena jugularis interna**, which is located below the m. omohyoideus. Clinically, the v. jugularis interna is infiltrated with a central venous catheter (CVC). Moreover, this muscle pulls the hyoid in a dorsocaudal direction and thus is involved in the process of swallowing. The muscle is innervated by the **ansa cerviclis profunda of the plexus cervicalis (C1-C3)**.

**Special Features:** A peculiarity of this muscle is its origin since for some humans the origin is the clavicula and not the scapula. This variation is called **musculus cleidohyoideus**; the function and innervation remain the same.

The middle neck fascia, also referred to as **lamina praetrachealis**, encloses both muscle bellies (the venter superior and inferior). At the site of the intermediate tendon, the lamina grows together with the **vagina carotica**, which is a firm sheath of connective tissue surrounding a vessel-nerve-strand. The structures of this strand are **a. carotis communis, v. jugularis interna** and **n. vagus**.

### Musculus sternohyoideus

This muscle originates at the posterior surface of the **manubrium sterni**, the medial end of the clavicle and partly from the **sternoclavicular joint (SCJ)**. It inserts at the **lower edge of the os hyoideum**. At active innervation via **ansa cervicalis profunda of the plexus cervicalis (C1-C3)** this muscle pulls the hyoid in a caudal direction and fixates it if the suprahyoid muscles tense.

**Special Features:** This muscle is morphologically both prepared and flat at origin, and it becomes narrower and thicker in the cranial direction.

### Musculus sternothyroideus

The m. sternothyroideus is thicker than the m. sternohyoideus, which is located more superficially. The m. sternothyroideus originates from the rear of the **manubrium sterni** and its insertion is at the **linea obliqua of the cartilago thyroidea**. This means that it is located directly next to the thyroid capsule. If the m. sternothyroideus tightens, the
thyroid capsule and the larynx are moved in a caudal direction. The innervation is the same as for all other infrahyoid muscles and takes place via the **ansa cervicalis profunda of the plexus cervicalis** (C1-C3).

**Special Features:** The connection with the **glandula thyroidea** is made of loose connective tissue.

**Musculus thyrohyoideus**

This muscle is the continuation of the m. sternothyroideus and thus originates at its insertion, the **linea obliqua of the cartilago thyroidea**. The insertion of the m. thyrohyoideus is at the **inner side of the lateral third of the corpus ossis hyoidei** and at the **lower edge of the medial surface of the cornu majus**. This means that its insertion is lateral and distal to the m. omohyoideus. If the m. thyrohyoideus tenses, it closes the larynx by pulling the m. hyoid and the cartilago thyroidea near to each other. It is also innervated by the **ansa cervicalis profunda of the plexus cervicalis** (C1-C3).

**Special Features:** Morphologically, the m. thyrohyoideus is a wide muscle plate covering and adhering to the **membrana thyrohyoidea**.

**Musculus levator glandulae thyroideae**

As already mentioned above, the m. levator glandulae thyroideae is not found in every human. It is a separated part of the m. thyrohyoideus. Its origin is at the **corpus ossis hyoidei** and its insertion at the **isthmus glandulae thyroidea**. At active innervation via the **ansa cervicalis profunda of the plexus cervicalis** (C1-C3), it raises the thyroid gland.

**Functional and pathophysiologicial information to the infrahyoid musculature**

The infrahyoid muscles pull the **os hyoideum** and the **larynx** in a caudal direction. Because of this additional function besides the stabilization of the larynx via the sternothyroidal muscle loop, the infrahyoid muscles have influence on phonation, the
human formation of speech. If the thyroid cartilage is tilted against the cricoid cartilage due to changes in the muscle tone, for example, the tension of the vocal chord also changes.

This leads to the formation of a hyperfunctional dysphonia, which presents itself as asynchronous oscillations of the vocal chord or even a unilateral halt of the vocal chord. Changes of the muscle tone cranially of the vocal chord plane influence the resonance chamber as well as the vocal sound. Furthermore, the supra- and infrahyoid musculature is a functional muscle loop with the os hyoideum as punctum fixum. If the masticatory muscles of the jaw joint are stabilized, supra- and infrahyoid muscles have the effect of a flexor on the cervical spine and reduce its lordosis. This means that these structures also play an important functional role with respect to the statics of the cervical spine.

Because of their connection to the hyoid, all the muscles described have an influence on the hyoid, which also has consequences for the motility of the osseous structures. If soft tissues are damaged, e.g. via neuronal lesions, this can lead to a position- and movement disorder of the os hyoideum, which can result in speech disorders. In the case of such symptoms an examination of the supra- and infrahyoid muscles is required.

Because of the direct connection to the jaw muscles and the cranium or the cranial base, it may also be necessary to examine the atlantooccipital joint in connection with possible positional changes. Treatment may be provided in the form of either physiotherapy or speech therapy, for example.

### Ansa cervicalis profunda

Since the infrahyoid musculature is usually only affected by secondary pathologies, which by and large result from neuronal lesions, it makes sense to take a closer look at the motor nerve branches that innervate the muscles.

The ansa cervicalis profunda is a nerve loop of segments C1-C3 which is responsible for the motor innervation of the infrahyoid muscles. The sensory innervation takes place via other structures. The ansa cervicalis profunda is formed by two stems: the radix superior and the radix inferior.

The motor fibers from segment C1 form the radix superior, which runs alongside the n. hypoglossus (cranial nerve XII) and then separates into the trigonum caroticum. There it fuses with the radix inferior, which proceeds diagonally above the v. jugularis interna, whose connection to the infrahyoid muscle should already be familiar to the
reader. The radix inferior contains fibers of **vertebral segments C2 and C3**.

**Vena jugularis interna**

The **sinus sigmoideus** fuses with the v. jugularis interna shortly before the foramen jugulare. Blood from the **sinus transversus** and the **sinus cavernosus** (and elsewhere) is transported in this vein. Basically, the entire blood supply of the inside of the skull is drained via the v. jugularis interna. Its clinical importance can be traced back to the **central venous catheter (CVC)**, particularly in the context of intensive care, where this catheter is inserted into the vein via a puncture.

**Possible questions for the infrahyoid musculature**

The answers can be found below the references.

1. **Which segments innervate the infrayoid musculature?**
   - A. C1-C2
   - B. C1-C3
   - C. C1-C4
   - D. C4-C5
   - E. C5-C7

2. **Which of the following infrahyoid muscles is not found in every human?**
   - A. omohyoideus
   - B. sternohyoideus
   - C. sternothyroideus
   - D. thyrohyoideus
   - E. levator glandulae thyroideae

3. **The m. omohyoideus is a vascular muscle for which vessel?**
   - A. jugularis anterior
   - B. jugularis externa
   - C. jugularis interna
   - D. subclavia
   - E. vertebalis

**References**


**Correct Answers:** 1A, 2E, 3C

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