An overview of the topography of the neck

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Abstract

This article describes in a systematic manner, the basic topographical arrangement of the viscera, muscles and the major neurovascular structures in the neck. It defines the anatomical relationships of these structures to one another and to the various fascial layers in the neck. A clear understanding of this arrangement is fundamental to a proper study of the surgical anatomy of the neck. Detailed anatomical descriptions of individual cervical viscera fall outside the scope and purpose of this article as do detailed accounts of the course and distribution of individual nerves and vessels in the neck.

Keywords Carotid sheaths; cervical lymph nodes; cervical viscera; deep cervical fascia; fascial planes

A thorough appreciation of the manner in which the various fascial layers and muscular planes in the neck are arranged and a detailed knowledge of the relationship of these fascial layers to the major vessels in the neck and to the cervical viscera is crucial to a proper understanding of the surgical anatomy of the neck and is an essential requisite to safety and precision in all neck operations. In addition, such knowledge helps the clinician immeasurably in making accurate diagnoses of clinical conditions involving the neck.

Conceptually, the neck may be divided arbitrarily into two regions: (i) a posterior cervical region and (ii) an anterior cervical region

The posterior region comprises the cervical vertebral column (with the contained cervical portion of the spinal cord), the post-vertebral musculature and other post-vertebral soft tissues. The posterior cervical region may be said to extend from the level of the superior nuchal line, above, to the level of the vertebra prominens, below. The vertebra prominens is usually the seventh cervical vertebra. The post-vertebral muscles are arranged in layers and function collectively as extensors of the cervical part of the vertebral column and/or as extensors of the head on the vertebral column. They are innervated segmentally by the dorsal rami of the cervical spinal nerves.

The anterior region consists of all the anterior and anterolateral cervical muscles, the prevertebral musculature, the cervical viscera and the major blood vessels of the head and neck. For all practical purposes, the anterior region may be said to extend from the skull base (inferior surface of the clivus) above, to the root of the neck below. The root of the neck or cervicothoracic junction is the area circumscribed by the shafts of the first ribs on either side, the sternal notch anteriorly and the upper border of the first thoracic vertebra, posteriorly.

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It is the anterior cervical region that is the principal subject of this article as it is in this region that most pathological conditions of interest to the head & neck surgeon are encountered.

Surgically relevant surface anatomy

A number of superficial, palpable landmarks provide useful topographical clues to the precise location of deep structures that are not usually palpable or visualized. Additionally, these landmarks bear a fairly constant relationship to specific vertebral levels, and thus aid the spinal surgeon in siting skin incisions at an appropriate level. It is instructive to consider these landmarks in order.

Assuming the subject to be in the anatomical position, with the neck neither hyperextended nor hyperflexed, the important landmarks and their corresponding vertebral levels are as follows:

- The **thyroid notch** is readily palpable and often visible. It lies in the midline at the level of the upper border of C4 vertebra (or disc between C3 and C4). The superior borders of the thyroid laminae can be felt on either side of the thyroid notch.
- The body of the **hyoid bone** lies 2 cm directly superior to the thyroid notch at the level of the body of C3.
- The angle of the mandible is easily felt and lies at the level of C2.
- The hard palate lies at the level of the anterior arch of the atlas (C1).
- The anterior arch of the cricoid cartilage lies 1 cm directly below the lower border of the thyroid cartilage; the interval between the thyroid and cricoid being bridged by the tough median cricothyroid ligament (membrane). The arch of the cricoid lies at the level of C6.
- At this level, on either side of the midline one can palpate the rather prominent transverse processes of C6.
- The sternal notch (i.e. the notched upper border of the manubrium sterni) lies at the level of the upper part of T3 (3rd thoracic vertebra).

Muscles of the neck (Figures 1 and 2)

All the voluntary muscles in the neck, both in the anterior and posterior cervical regions, are bilaterally represented and symmetrically arranged.

The muscles in the anterior cervical region of the neck may be conveniently allocated to the following groups:

- superficial group (comprising the right and left platysma muscles).
- anterolateral group (comprising the sternocleidomastoid and trapezius muscles bilaterally)
- anterior group (made up of two subgroups)
  - a suprahyoid subgroup comprising mylohyoid, anterior and posterior bellies of digastric and stylohyoid
  - an infrahyoid subgroup comprising the strap muscles, i.e. sternohyoid, omohyoid, sternothyroid and thyrohyoid
- prevertebral (made up of two subgroups)
  - anterior prevertebral muscles exemplified by longus colli, longus capitis and a couple of other small muscles, all running longitudinally in line with the cervical vertebral bodies
  - lateral prevertebral muscles comprising scalenus anterior, medius and posterior, and levator scapulae. All of

Please cite this article in press as: Mahadevan V, An overview of the topography of the neck, Surgery (2018), https://doi.org/10.1016/j.mpsur.2018.08.011

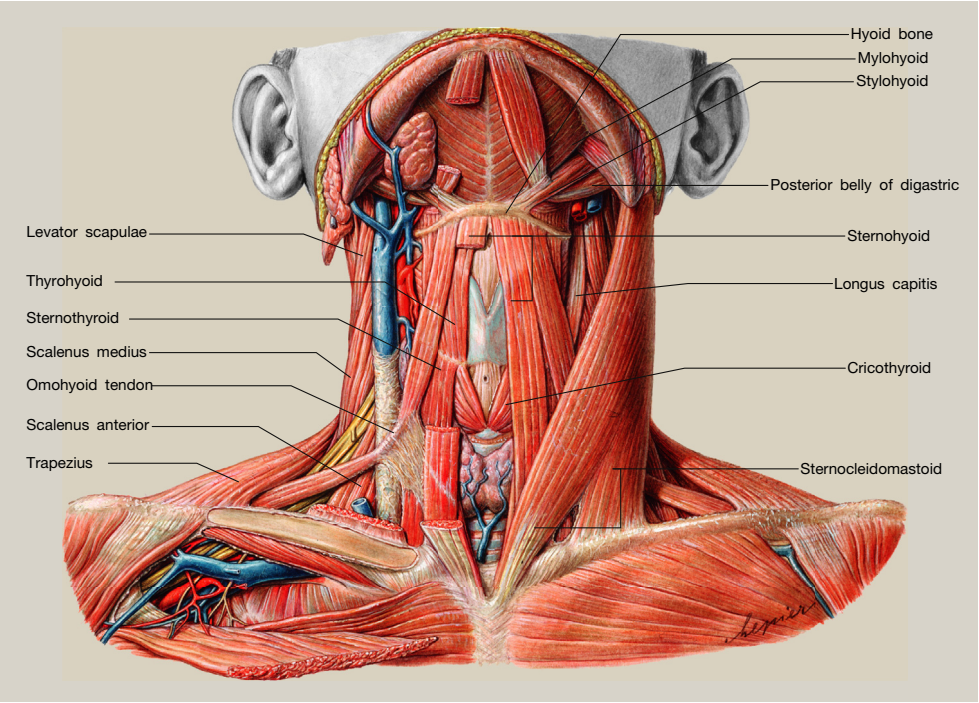

Figure 1 Muscles of the anterior region of neck. Note: right sternocleidomastoid, sternohyoid and anterior belly of digastric have been removed. Observe also that the carotid sheath is largely overlapped by the sternocleidomastoid muscle.

these arise from the transverse processes of cervical vertebrae and run inferolaterally to attach to the upper part of the rib cage or upper border of scapula.

All the muscles in the anterior region of the neck are innervated directly or indirectly by anterior rami of cervical spinal nerves (with the exception of platysma which is, of course, innervated by the facial nerve).

Tissue planes and fascial layers in the anterior part of neck (Figure 3)

The skin is thinner and generally more mobile over the anterior part of the neck than over the posterior part.

Deep to the skin of the neck is the superficial fascia which is essentially a layer of subcutaneous fat arranged circumferentially around the neck. The amount of fat in this layer varies between individuals, and also, to some extent, between the anterior and posterior aspects of the neck in the same individual; being generally somewhat thinner in the front of the neck than in the back. Lying immediately deep to the subcutaneous fat, on either side of the anterior midline is the platysma, a relatively thin but wide sheet of muscle (Figure 4). The platysma is confined to the anterior and anterolateral parts of the neck and does not extend to the back of the neck. Superiorly, platysma crosses superficial to the lower border of the mandible to become continuous with the SMAS (superficial musculo-aponeurotic system) layer of the face; while inferiorly, it crosses superficial to the clavicle and blends with the fascia overlying pectoralis major, about 1–2 cm below the level of the clavicle. Above the level of the hyoid, the medial borders of the right and left platysma muscles are contiguous, whereas, below the hyoid level they are separated from each other by an interval of 2–3 cm. Subjacent to the platysma is the ***investing layer of deep cervical fascia*** which invests the neck like a collar. It is the most superficial of the various layers of the deep cervical fascia (the other layers being the prevertebral fascia, the carotid sheaths and the pretracheal fascia) (see Figure 3). Superiorly, the investing layer of deep cervical fascia is attached to the entire length of the lower border of the mandible, from midline to angle on either side. Traced posteriorly from the angle of the mandible, it is seen to be attached to the mastoid processes and superior nuchal lines on either side and to the external occipital protuberance in the posterior midline. In the interval between the angle of the mandible and the mastoid process, the investing layer of deep cervical fascia splits to enclose the parotid salivary gland as the parotid fascia or parotid capsule.

Inferiorly the line of attachment of the investing layer of deep cervical fascia is to the sternal notch (i.e. the notched, thick upper border of the manubrium sterni), and in continuity, on each side, to the upper surface of the clavicle, the acromion, the spine of the scapula and thus to the posterior midline. Traced laterally from the anterior midline, between its upper and lower attachments, the investing layer of deep cervical fascia meets, on each side, the medial border of the corresponding sternocleidomastoid muscle and splits to enclose the muscle. Thereafter it continues posterolaterally as the fascial roof of the ipsilateral posterior triangle of the neck, and upon reaching the anterior edge of the trapezius muscle, it splits to enclose the trapezius (see Figure 3).

In its descent from the lower border of the mandible, the investing layer of deep cervical fascia is firmly adherent to the front of the hyoid body and to the lateral aspects of the greater horns of the hyoid. Thus all the cervical viscera, major blood vessels and nerves of the neck, and all the cervical muscles (with the sole exception of the platysma) come to lie within the sweep of the investing layer of deep cervical fascia.

Please cite this article in press as: Mahadevan V, An overview of the topography of the neck, Surgery (2018), https://doi.org/10.1016/j.mpsur.2018.08.011