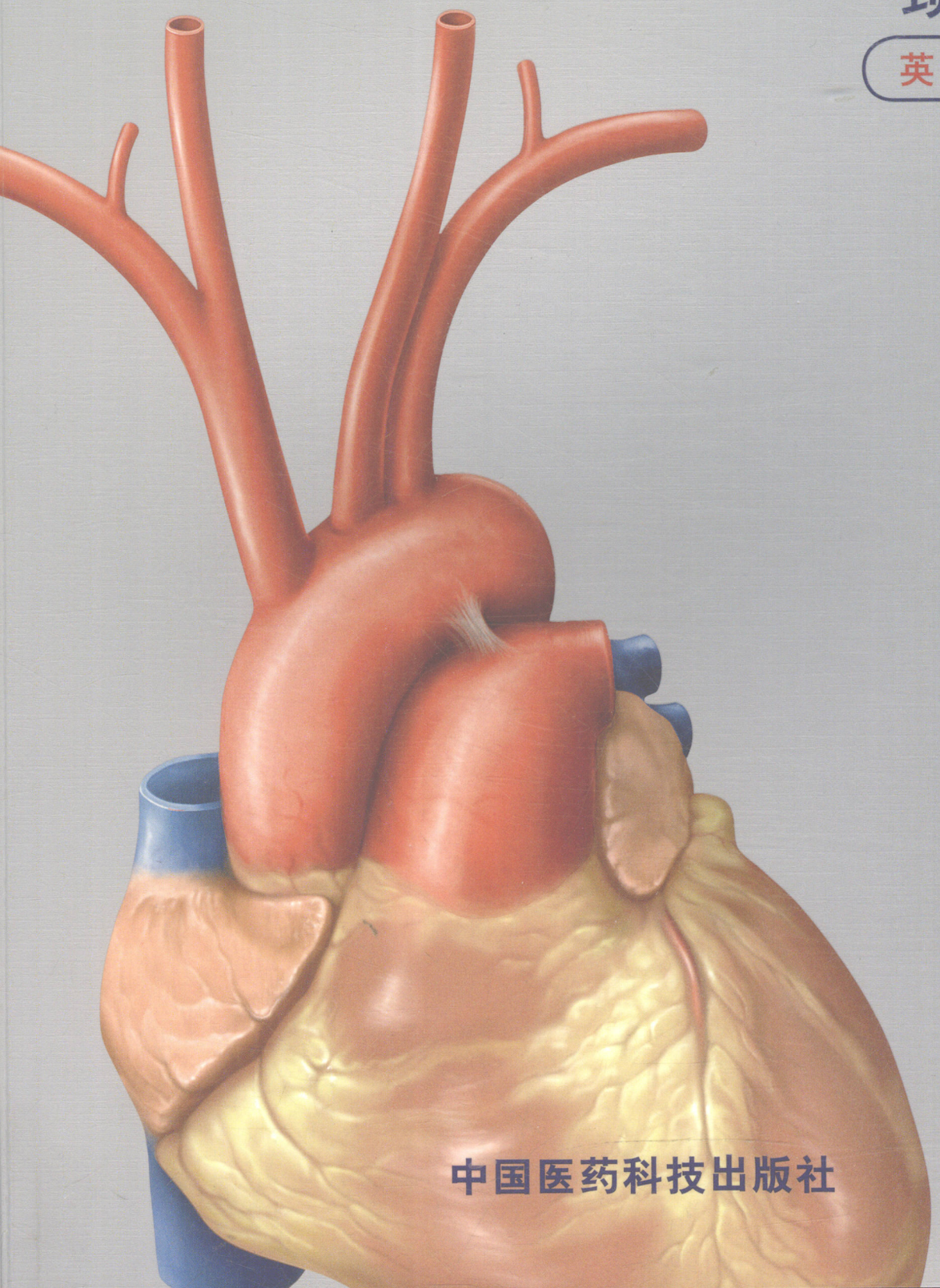
THIEME Atlas of Anatomy

THIEME解剖图谱

Neck and Internal Organs

颈部与内脏

英文影印版



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Illustrators
Markus Voll, Fürstenfeldbruck, Germany;
Karl Wesker, Berlin, Germany (homepage: www.karlwesker.de)

Translator
Terry Telger, Fort Worth, Texas, USA

Rüdigerstraße 14
D-70469 Stuttgart
Germany
http://www.thieme.de
Thieme New York, 333 Seventh Avenue,
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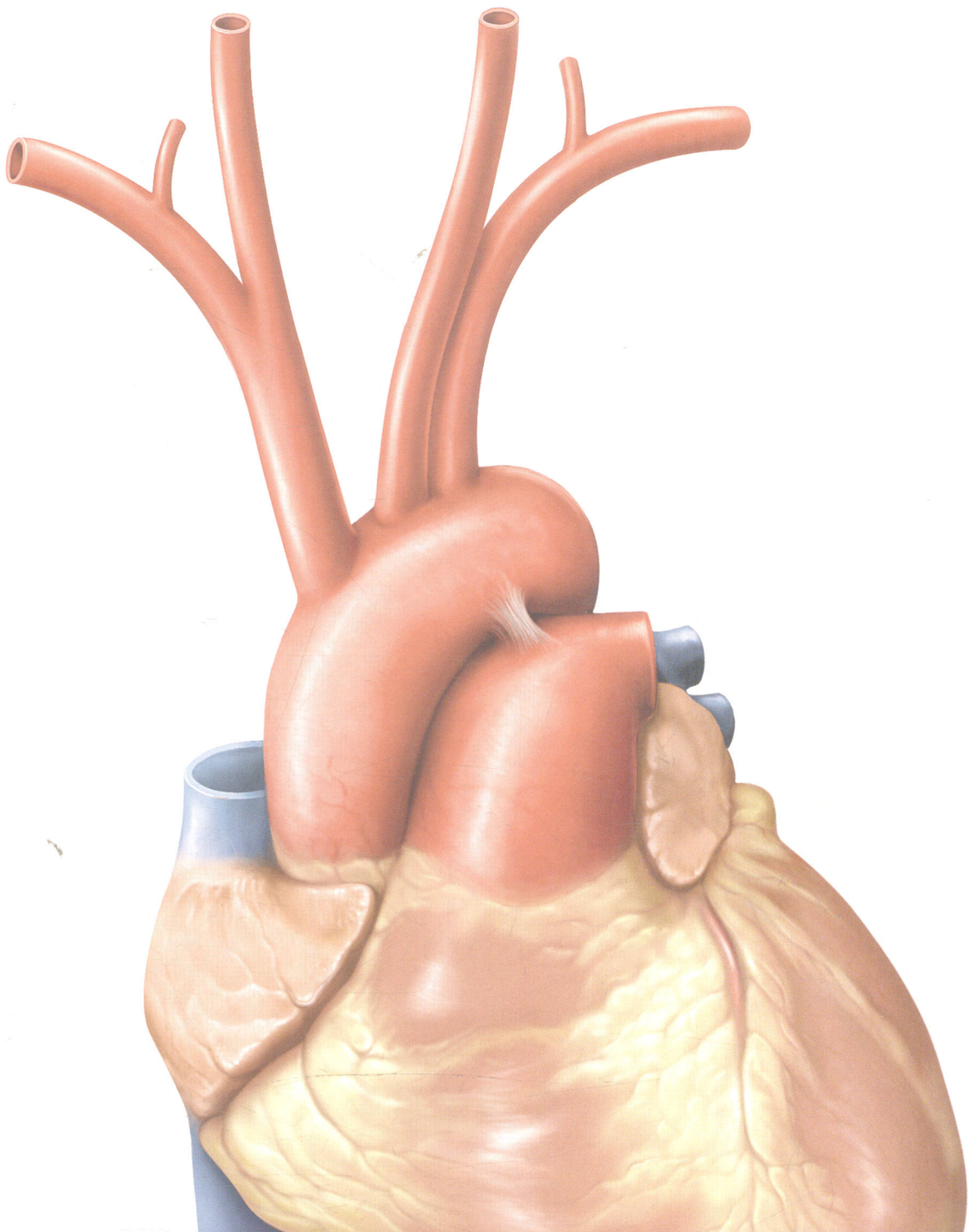

Neck
and Internal Organs

THIEME
Atlas of Anatomy

Consulting Editors

Lawrence M. Ross, M.D., Ph.D.,
The University of Texas Medical School at Houston

Edward D. Lamperti, Ph.D.,
Boston University School of Medicine

Authors

Michael Schuenke, M.D., Ph.D.,
University of Kiel Medical School

Erik Schulte, M.D.,
University of Mainz Medical School

Udo Schumacher, M.D.,
FRCPath, CBiol, FIBiol, DSc,
Hamburg University Medical Center

In collaboration with Juergen Rude

Illustrations by

Markus Voll

Karl Wesker

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78 Tables

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Foreword

Our enthusiasm for the THIEME Atlas of Anatomy began when each of us, independently, saw preliminary material from this Atlas. Both of us continue to be captivated by the new approach, the conceptual organization, and by the stunning quality and detail of the images of the Atlas. We were delighted by the ongoing opportunity provided by the editors at Thieme to cooperate with them in making this outstanding resource available to our students and colleagues in North America.

As consulting editors we were asked to review, for accuracy, the English edition of the THIEME Atlas of Anatomy. Our work involved a conversion of nomenclature to terms in common usage and some organizational changes to reflect pedagogical approaches in anatomy programs in North America. This task was eased greatly by the clear organization of the original text. In all of this, we have tried diligently to remain faithful to the intentions and insights of the original authors.

We extend our special thanks to Brian R. MacPherson, Ph. D. for his timely assistance in the role of a Consulting Editor during the emergency illness of one editor (LMR).

We would like to thank the team at Thieme Medical Publishers who worked with us: Kelly Wright, Developmental Editor, and Cathrin E. Schulz M.D., Executive Editor, for checking and correcting our work and for their constant availability and encouragement.

We would also like to extend our heartfelt thanks to Stefanie Langner, Production Manager, for preparing this volume with care and speed.

Lawrence M. Ross,
Edward D. Lamperti

Preface

As it started planning this Atlas, the publisher sought out the opinions and needs of students and lecturers in both the United States and Europe. The goal was to find out what the "ideal" atlas of anatomy should be—ideal for students wanting to learn from the atlas, master the extensive amounts of information while on a busy class schedule, and, in the process, acquire sound, up-to-date knowledge. The result of this work is this Atlas. The THIEME Atlas of Anatomy, unlike most other atlases, is a comprehensive educational tool that combines illustrations with explanatory text and summarizing tables, introducing clinical applications throughout, and presenting anatomical concepts in a step-by-step sequence that allows for the integration of both system-by-system and topographical views.

Since the THIEME Atlas of Anatomy is based on a fresh approach to the underlying subject matter itself, it was necessary to create for it an entirely new set of illustrations—a task that took eight years. Our goal was to provide illustrations that would compellingly demonstrate anatomical relations and concepts, revealing the underlying simplicity of the logic and order of human anatomy without sacrificing detail or aesthetics.

With the THIEME Atlas of Anatomy, it was our intention to create an atlas that would guide students in their initial study of anatomy, stimulate their enthusiasm for this intriguing and vitally important subject, and provide a reliable reference for experienced students and professionals alike.

"If you want to attain the possible, you must attempt the impossible" (Rabindranath Tagore).

Michael Schünke, Erik Schulte, Udo Schumacher,
Markus Voll, and Karl Wesker

Acknowledgments

First we wish to thank our families. This atlas is dedicated to them.

We also thank Prof. Reinhard Gossrau, M.D., for his critical comments and suggestions. We are grateful to several colleagues who rendered valuable help in proofreading: Mrs. Gabriele Schünke, Jakob Fay, M.D., Ms. Claudia Dücker, Ms. Simin Rassouli, Ms. Heinke Teichmann, and Ms. Sylvia Zilles. We are also grateful to Dr. Julia Jürns-Kuhnke for helping with the figure labels.

We extend special thanks to Stephanie Gay and Bert Sender, who composed the layouts. Their ability to arrange the text and illustrations on facing pages for maximum clarity has contributed greatly to the quality of the Atlas.

We particularly acknowledge the efforts of those who handled this project on the publishing side:

Jürgen Lüthje, M.D., Ph.D., executive editor at Thieme Medical Publishers, has "made the impossible possible." He not only reconciled the wishes of the authors and artists with the demands of reality but also managed to keep a team of five people working together for years on a project whose goal was known to us from the beginning but whose full dimensions we came to appreciate only over time. He is deserving of our most sincere and heartfelt thanks.

Sabine Bartl, developmental editor, became a touchstone for the authors in the best sense of the word. She was able to determine whether a beginning student, and thus one who is not (yet) a professional, could clearly appreciate the logic of the presentation. The authors are indebted to her.

We are grateful to Antje Bühl, who was there from the beginning as project assistant, working "behind the scenes" on numerous tasks such as repeated proofreading and helping to arrange the figure labels.

We owe a great dept of thanks to Martin Spencker, Managing Director of Educational Publications at Thieme, especially to his ability to make quick and unconventional decisions when dealing with problems and uncertainties. His openness to all the concerns of the authors and artists established conditions for a cooperative partnership.

Without exception, our collaboration with the entire staff at Thieme Medical Publishers was consistently pleasant and cordial. Unfortunately we do not have room to list everyone who helped in the publication of this atlas, and we must limit our acknowledgments to a few colleagues who made a particularly notable contribution: Rainer Zepf and Martin Waletzko for support in all technical matters; Susanne Tochtermann-Wenzel and Manfred Lehnert, representing all those who were involved in the production of the book; Almut Leopold for the Index; Marie-Luise Kürschner and her team for creating the cover design; to Birgit Carlsen and Anne Döbler, representing all those who handled marketing, sales, and promotion.

The Authors

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Neck

1.1 The Neck: General Aspects

The neck is the region of the body betweeen the head and trunk. Its skeletal foundation is the vertebral column. Its anterior surface anatomy is defined by muscles and viscera (e.g., the larynx), and it is traversed by a number of closely related neurovascular structures. The muscles, viscera, and neurovascular structures are all enveloped by cervical fasciae (see **B**), which subdivide the neck into compartments. In the sections that follow, these fascial spaces (see **B** and **D**) will provide a basis for discussing the neck muscles by functional groups. This will be followed by a description of the arteries, veins, lymphatics, and nerves (including the peripheral autonomic nervous system) and then the cervical viscera. The usual order of presentation, in which viscera are discussed before nerves and vessels, has been altered in order to emphasize the unique importance of the neurovascular pathways in the neck. The closing sections on topographical and sectional anatomy will explore the interrelationships of the muscles, neurovascular structures, and viscera.

A Sequence of topics in this chapter

Neck muscles
- Superficial muscles
- Nuchal muscles
- Suprahyoid muscles
- Infrahyoid muscles
- Prevertebral muscles
- Lateral (deep) neck muscles

Neurovascular structures
- Arteries
- Veins
- Lymphatic system
- Nerves

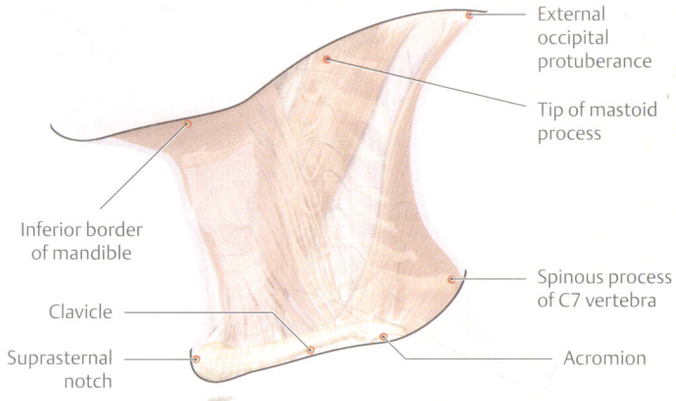
Cervical viscera
- Embryology of the cervical viscera
- Thyroid and parathyroid glands
- Larynx
- Pharynx
- Parapharyngeal space

Topographical anatomy
- Surface anatomy and regions
- Anterior cervical region
- Lateral cervical regions
- Posterior cervical and occipital regions
- Cross-sectional anatomy

B Cervical fascia

Deep to the skin is the superficial cervical fascia (subcutaneous tissue) which contains the platysma muscle anterolaterally. Deep to the superficial fascia are the following layers of deep cervical fascia:

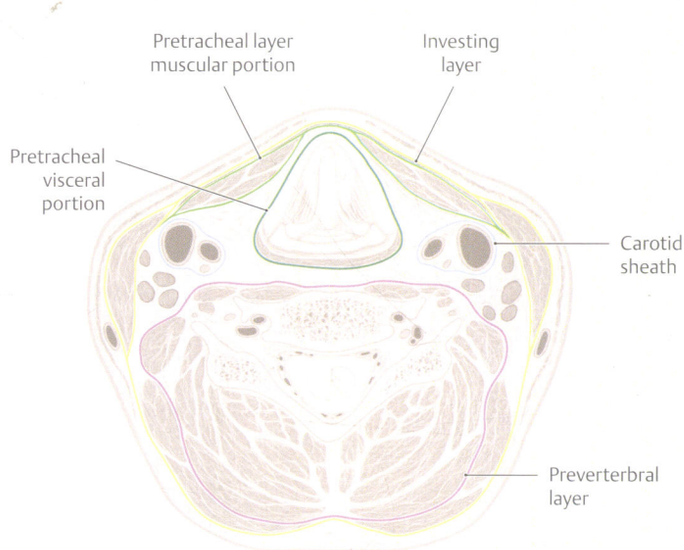
1. Investing layer: envelops the entire neck, and splits to enclose the sternocleidomastoid and trapezius muscles.
2. Pretracheal layer: the muscular portion encloses the infrahyoid muscles, while the visceral portion surrounds the thyroid gland, larynx, trachea, pharynx, and esophagus.
3. Prevertebral layer: surrounds the cervical vertebral column, and the muscles associated with it.
4. Carotid sheath: encloses the common carotid artery, internal jugular vein, and vagus nerve.



C Superficial and inferior boundaries of the neck

Left lateral view. The following palpable structures define the superior and inferior boundaries of the neck:

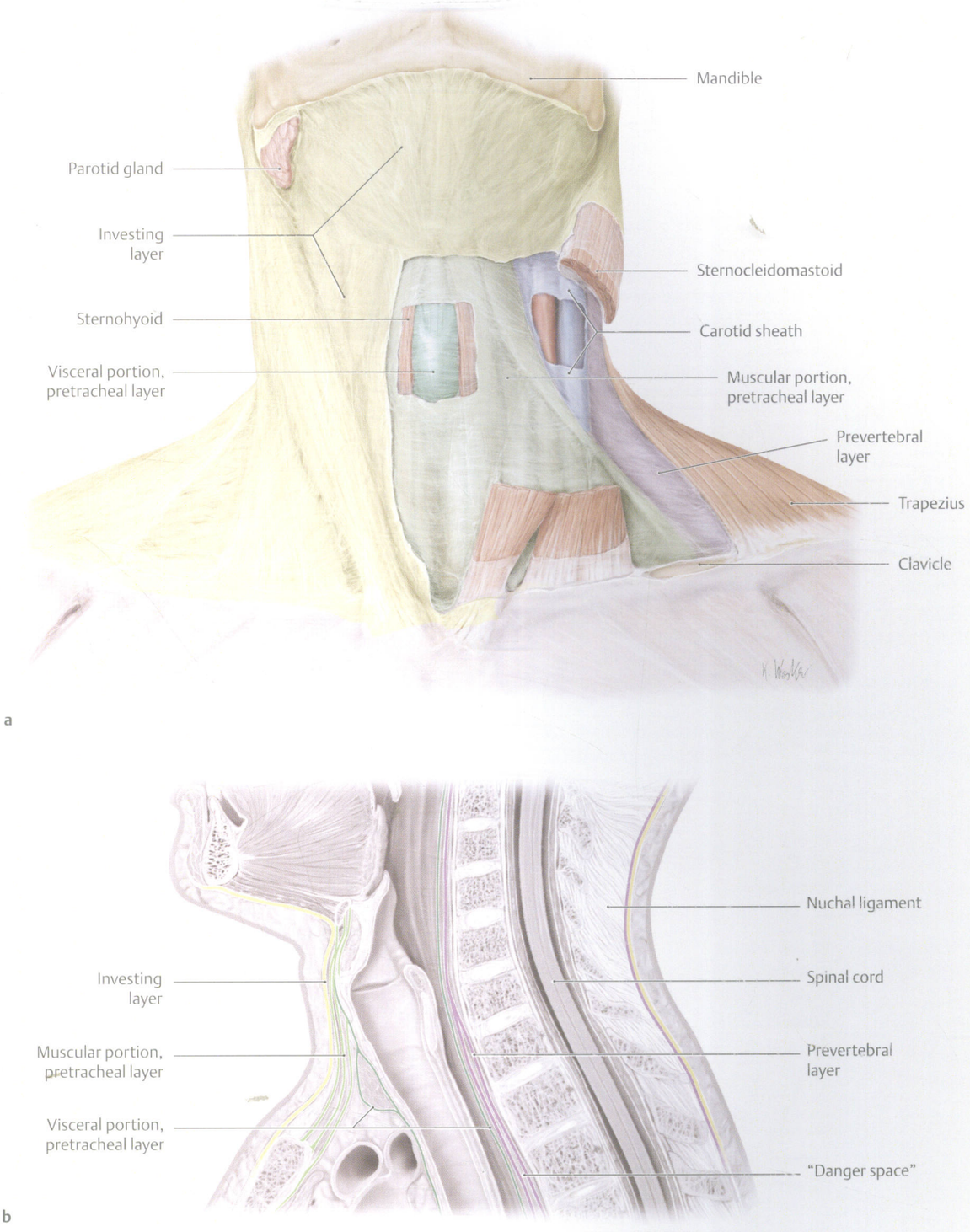
- Superior boundaries: inferior border of the mandible, tip of the mastoid process, and external occipital protuberance
- Inferior boundaries: suprasternal notch, clavicle, acromion, and spinous process of the C 7 vertebra



D Relationships of the deep fascia in the neck. Transverse section at the level of the C 5 vertebra

The full extent of the cervical fascia is best appreciated in a transverse section of the neck:

- The *muscle fascia* splits into three layers:
  - Superficial lamina (yellow)
  - Pretracheal lamina (light green)
  - Prevertebral lamina (violet)
- There is also a neurovascular fascia, called the *carotid sheath* (light blue), and
- a *visceral fascia* (dark green).



E Fascial relationships in the neck

a Anterior view. The cutaneous muscle of the neck, the platysma, is highly variable in its development and is subcutaneous in location, overlying the superficial cervical fascia. In the dissection shown, the platysma has been removed at the level of the inferior mandibular border on each side. The cervical fasciae form a fibrous sheet that encloses the muscles, neurovascular structures, and cervical viscera (see **B** for further details). These fasciae subdivide the neck into spaces, some of which are open superiorly and inferiorly for the passage of neurovascular structures. The *investing layer* of the deep cervical fascia has been removed at left center in this dissection. Just deep to the investing layer is the *muscular portion of the pretreacheal layer*, part of which has been removed to display the *visceral portion of the pretracheal layer*. The neurovascular structures are surrounded by a condensation of the cervical fascia called the *carotid sheath*. The deepest layer of the deep cervical fascia, called the *prevertebral layer*, is visible posteriorly on the left side. These fascia-bounded connective-tissue spaces in the neck are important clinically because they provide routes for the spread of inflammatory processes, although the inflammation may (at least initially) remain confined to the affected compartment.

b Left lateral view. This midsagittal section shows that the deepest layer of the deep cervical fascia, the prevertebral layer, directly overlies the vertebral column in the median plane and is split into two parts. With tuberculous osteomyelitis of the cervical spine, for example, a gravitation abscess may develop in the "danger space" along the prevertebral fascia (retropharyngeal abscess). This fascia encloses muscles laterally and posteriorly (see **D**). The carotid sheath is located farther laterally and does not appear in the midsagittal section.

1.2 Overview and Superficial Neck Muscles

A Scheme used for classifying the neck muscles into groups

The next few sections follow the outline below, which is based on the topographical anatomy of the neck. Various schemes may be used, however: While the nuchal muscles are classified as neck muscles from a topographical standpoint, they belong functionally to the category of intrinsic back muscles (which are not described here).

Superficial neck muscles
- Platysma
- Sternocleidomastoid
- Trapezius*

Suprahyoid muscles
- Digastric
- Geniohyoid
- Mylohyoid
- Stylohyoid

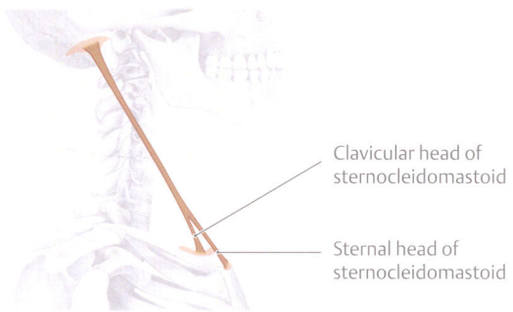
Infrahyoid muscles
- Sternohyoid
- Sternothyroid
- Thyrohyoid
- Omohyoid

* Not a neck muscle in the strict sense, but included here owing to its topographical importance

Prevertebral muscles (deep strap muscles)
- Longus capitis
- Longus colli
- Rectus capitis anterior
- Rectus capitis lateralis

Lateral (deep) neck muscles
- Scalenus anterior
- Scalenus medius
- Scalenus posterior

Nuchal muscles (intrinsic back muscles)
- Semispinalis capitis
- Semispinalis cervicis
- Splenius capitis
- Splenius cervicis
- Longissimus capitis
- Iliocostalis cervicis
- Suboccipital muscles



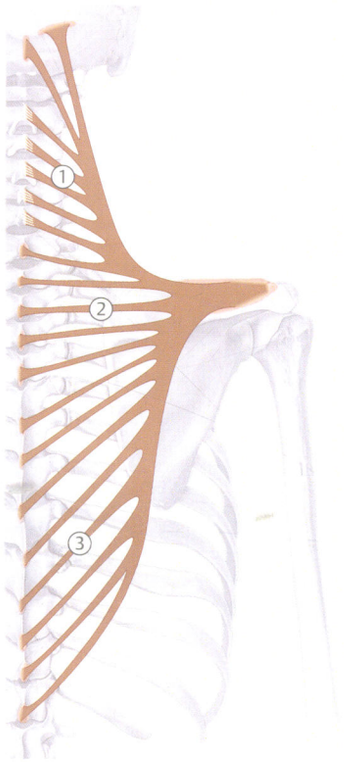
B Schematic of the sternocleidomastoid

Origin:
- Sternal head: manubrium sterni
- Clavicular head: medial third of the clavicle

Insertion: Mastoid process and superior nuchal line

Actions:
- Unilateral:
  - Tilts the head to the same side
  - Rotates the head to the opposite side
- Bilateral:
  - Extends the head
  - Assists in respiration when the head is fixed

Innervation: Accessory nerve (cranial nerve XI [CN XI]) and direct branches from the cervical plexus (C 1—C 4)



C Schematic of the trapezius

Origin:
① Descending part:
- Occipital bone (superior nuchal line and external occipital protuberance)
- The spinous processes of all cervical vertebrae via the nuchal ligament

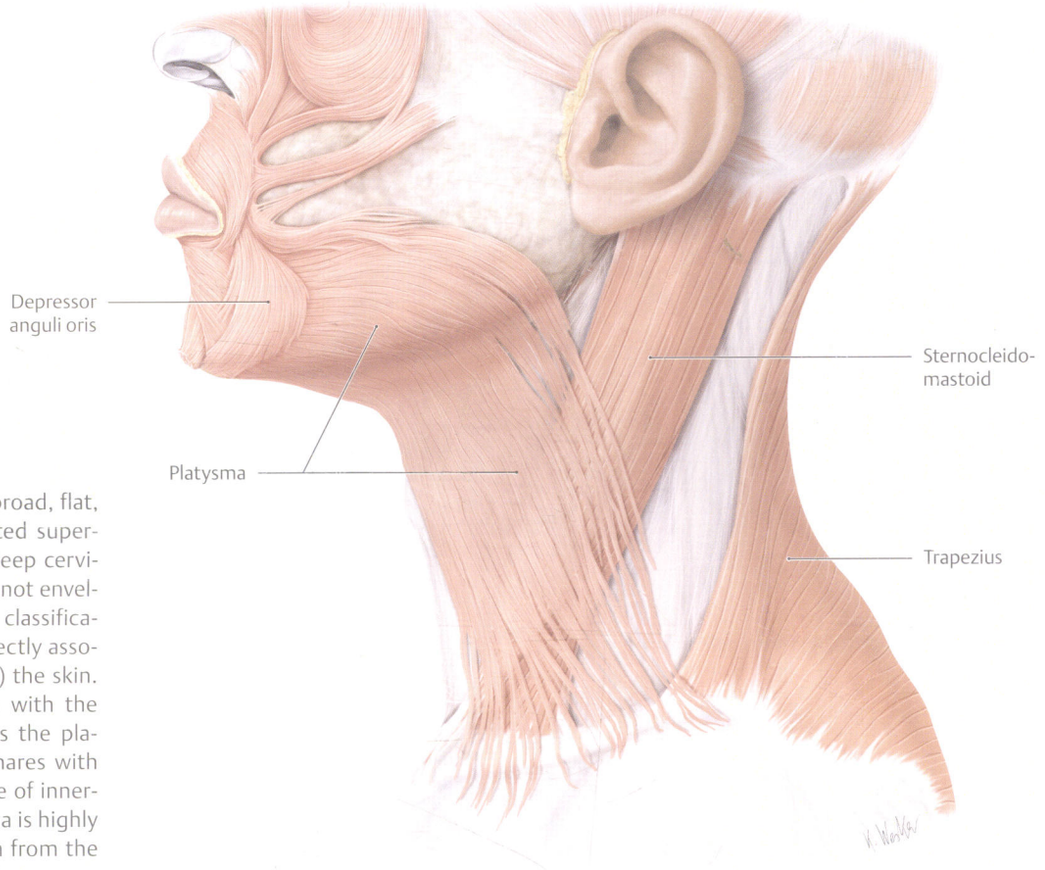
② Transverse part:
Broad aponeurosis at the level of the T 1–T 4 spinous processes

③ Ascending part:
Spinous processes of T 5–T 12

Insertion:
- Lateral third of the clavicle (descending part)
- Acromion (transverse part)
- Scapular spine (ascending part)

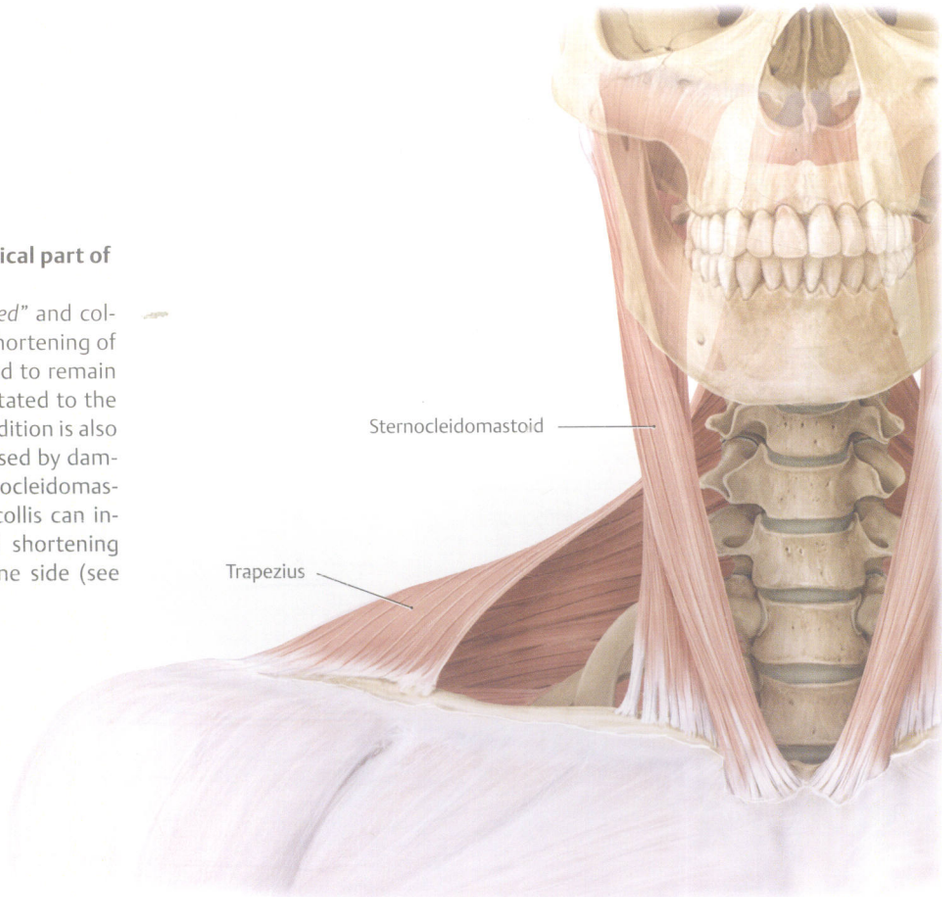
Actions:
- Descending part:
  - Draws the scapula obliquely upward and rotates it externally (acting with the inferior part of the serratus anterior)
  - Tilts the head to the same side and rotates it to the opposite side (with the shoulder girdle fixed)
- Transverse part: draws the scapula medially
- Ascending part: draws the scapula medially downward (supports the rotating action of the descending part)
- Entire muscle: stabilizes the scapula on the thorax

Innervation: Accessory nerve (CN XI) and cervical plexus (C 2–C 4)



D Cutaneous muscle of the neck (platysma)

Left lateral view. The platysma is a broad, flat, subcutaneous muscular sheet located superficial to the investing layer of the deep cervical fascia. Unlike most muscles, it is not enveloped in its own fascial sheath (see classification scheme in **A**), but is instead directly associated with (and in part inserts into) the skin. This characteristic, which it shares with the muscles of facial expression, makes the platysma difficult to dissect. It also shares with those craniofacial muscles its source of innervation: the facial nerve. The platysma is highly variable in size—its fibers may reach from the lower part of the face to the upper thorax.



E Superficial neck muscles: sternocleidomastoid and cervical part of trapezius, anterior view

Torticollis (from L. tortus = *"twisted"* and collum = *"neck"*) is a contraction or shortening of the neck muscles causing the head to remain tilted to the affected side, and rotated to the other (contralateral) side. The condition is also called wryneck. It can also be caused by damage to the innervation of the sternocleidomastoid (see p. 19). Congenital torticollis can involve degenerative scarring and shortening of the sternocleidomastoid on one side (see p. 43).