

Atlas of Anatomy

Second Edition

Edited by
Anne M. Gilroy
Brian R. MacPherson
Lawrence M. Ross

Based on the work of
Michael Schuenke
Erik Schulte
Udo Schumacher

Illustrations by
Markus Voll
Karl Wesker

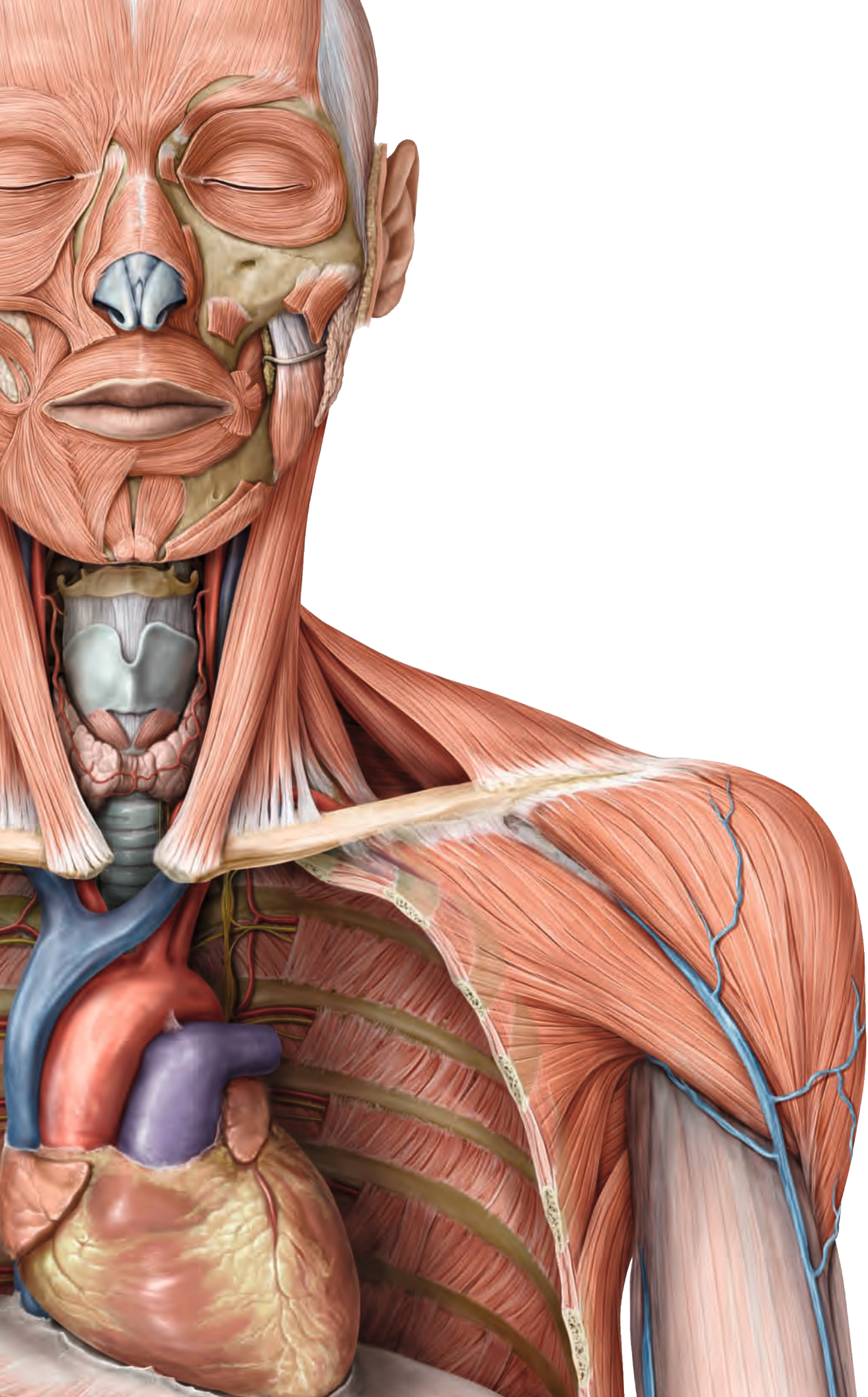


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Dedication

To my father, Francis Gilroy, whose dedication to medicine has been a greater inspiration to me than he has ever realized; to my students who lovingly tolerate, and sometimes share, my passion for human anatomy; and most of all, to my sons, Colin & Bryan, whose love and support I treasure beyond all else.

— *A.M.G.*

To my friend and mentor, Dr. Ken McFadden of the Division of Anatomy at the University of Alberta, who ensured I received the training in gross anatomy instruction required to be successful, and to the thousands of professional students who I have taught over the past 30 years, honing these skills. However, none of the success I've enjoyed during my time in academia would have been possible without the constant support, participation, and encouragement of my wife, Cynthia Long.

— *B.R.M.*

To my wife Irene, and to the children, Chip, Jennifer, Jocelyn & Barry, Tricia, Katie & Snapper, Trey & Alison, and to all my students who have taught me so well.

— *L.M.R.*

Acknowledgements

We would like to thank the authors of the original award-winning Thieme Atlas of Anatomy, three-volume series, Michael Schuenke, Erik Schulte, and Udo Schumacher, and the illustrators, Karl Wesker and Marcus Voll, for their work over the course of many years.

We thank the many instructors and students who have pointed out to us what we have done well and brought to our attention errors, ambiguities, and new information, or have suggested how we could present a topic more effectively. This input, combined with our experience teaching with the Atlas, have guided our work on this edition.

We again cordially thank the members of the first edition Advisory Board for their contributions:

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Foreword

This Atlas of Anatomy, in my opinion, is the finest single-volume atlas of human anatomy that has ever been created. Two factors make it so: the images and the way they have been organized.

The artists, Markus Voll and Karl Wesker, have created a new standard of excellence in anatomical art. Their graceful use of transparency and their sensitive representation of light and shadow give the reader an accurate three-dimensional understanding of every structure.

The authors have organized the images so that they give just the flow of information a student needs to build up a clear mental image of the human body. Each two-page spread is a self-contained lesson that unobtrusively shows the hand of an experienced and thoughtful teacher. I wish I could have held this book in my hands when I was a student; I envy any student who does so now.

Robert B. Acland
Louisville, KY

February 2012

Preface to the Second Edition

We were gratified by the high praise we received from all corners of the anatomic world after publication of the first edition of Atlas of Anatomy. The generous comments of colleagues and students assured us that the atlas was a valuable addition to the learning experience, citing among other things the unparalleled artwork that extends to the level of individual muscles and muscles tables presented in an easy-to-learn summary format. We are especially indebted to those of you who reported omissions, inconsistencies, and typographical, factual, and even artistic errors that escaped the authors, editors, and reviewers. We encourage your continued input, as this motivates and helps us to make each edition of the atlas even more effective than the previous one.

Our mission in this new edition, as in the first edition, is to provide the most complete, up-to-date and effective reference for teaching and studying human anatomy. The core of this new edition remains the more than 2,400 elegant illustrations and schematics, over 150 summary tables, and the effective two-page spreads for presenting concepts. As in the first edition, the presentation is by region and within each region the content is presented in a similar order. Each unit now starts with the surface anatomy of that region and follows with bones, muscles, vasculature, nerves, through to the topographical summary of the area. Where appropriate, sectional anatomy is found at the end of each chapter. In this edition we have reorganized some chapters and spreads in an effort to more closely parallel the progression and content of a typical dissection curriculum. New artwork and expanded text now offers more comprehensive coverage of specific topics. Images that illustrate more than one organ or region are still conveniently repeated as needed. In this second edition of Atlas of Anatomy, readers will find that we have:

- reorganized the material of the combined Abdomen & Pelvis unit into two separate units, Abdomen and Pelvis & Perineum, with the addition of many new illustrations.
- moved the spreads on the spinal cord and cranial meninges from the Neuroanatomy unit into the Back and Head & Neck units, where they are more accessible to students of gross anatomy.
- expanded the surface anatomy spreads and moved them to the beginning of each unit.
- added sectional anatomy spreads to the end of each unit.
- added new and updated artwork in all sections of the atlas.

We hope that students and teaching faculty find these revisions helpful.

Our colleagues at Thieme Publishers have been the essential core of this effort and we are enormously grateful for their support. We especially thank Anne Vinnicombe, Editorial Director for Educational Products, who throughout this project has been available to advise, encourage, and at times even commiserate with each of us. Her professional vision has been a valuable contribution to this manuscript. She is the force who kept us on track and always moving forward.

We also want to thank our Developmental Editor, Avalon Garcia, who worked tirelessly, and with admirable patience, to coordinate and interpret our input.

Additional thanks go to our Production Editor, Megan Conway, who in spite of the hectic schedules of the three authors, coordinated the production of this new volume with remarkable speed with the able help of Editorial Assistant, Debra Zharnest,

Anne M. Gilroy
Brian R. MacPherson
Lawrence M. Ross

February 2012
Worcester, MA, Lexington, KY, and Houston, TX

Preface to the First Edition

Each of the authors was amazed, and impressed with the extraordinary detail, accuracy, and beauty of the illustrations that were created for the Thieme Atlas of Anatomy. We feel these images are one of the most significant additions to anatomical education in the past 50 years. It was our intent to use these exceptional illustrations as the cornerstone of our effort in creating a concise single volume Atlas of Anatomy for the curious and eager health science student.

Our challenge was first to select from this extensive collection, those images that are most instructive and illustrative of current dissection approaches. Along the way however, we realized that creating a single volume atlas was much more than choosing images: each image has to convey a significant amount of detail while the appeal and labeling need to be clean and soothing to the eye. Therefore, hundreds of illustrations were drawn new or modified to fit the approach of this new atlas. In addition, key schematic diagrams and simplified summary-form tables were added wherever needed. Dozens of applicable radiographic images and important clinical correlates have been added where appropriate. Additionally, surface anatomy illustrations are accompanied by questions designed to direct the student's attention to anatomic detail that is most relevant in conducting the physical exam. Elements from each of these features are arranged in a regional format to facilitate common dissection approaches. Within each region, the various components are examined systemically, followed by topographical images to tie the systems together within the region. In all of this, a clinical perspective on the anatomical structures is taken. The unique two facing pages "spread" format focuses the user to the area/topic being explored.

We hope these efforts — the results of close to 100 combined years experience teaching the discipline of anatomy to bright, enthusiastic students — has resulted in a comprehensive, easy-to-use resource and reference.

We would like to thank our colleagues at Thieme Publishers who so professionally facilitated this effort. We cannot thank enough, Cathrin E. Schulz, M.D., Editorial Director Educational Products, who so graciously reminded us of deadlines, while always being available to "trouble shoot" problems. More importantly, she encouraged, helped, and complimented our efforts.

We also wish to extend very special thanks and appreciation to Bridget Queenan, Developmental Editor, who edited and developed the manuscript with an outstanding talent for visualization and intuitive flow of information. We are very grateful to her for catching many details along the way while always patiently responding to requests for artwork and labeling changes.

Cordial thanks to Elsie Starbecker, Senior Production Editor, who with great care and speed produced this atlas with its over 2,200 illustrations. Finally thanks to Rebecca McTavish, Developmental Editor, for joining the team in the correction phase. So very much of their hard work has made the Atlas of Anatomy a reality.

Anne M. Gilroy
Brian R. MacPherson
Lawrence M. Ross

March 2008,
Worcester, MA, Lexington, KY and Houston, TX

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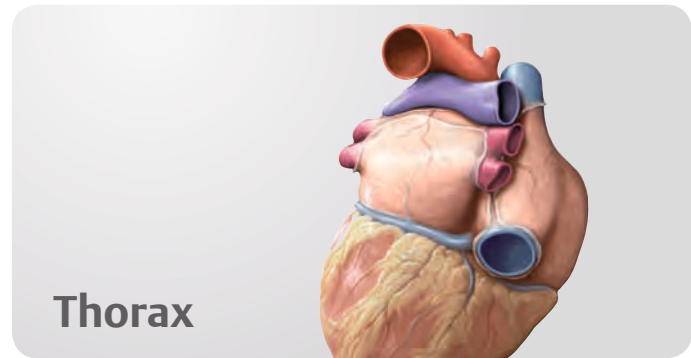
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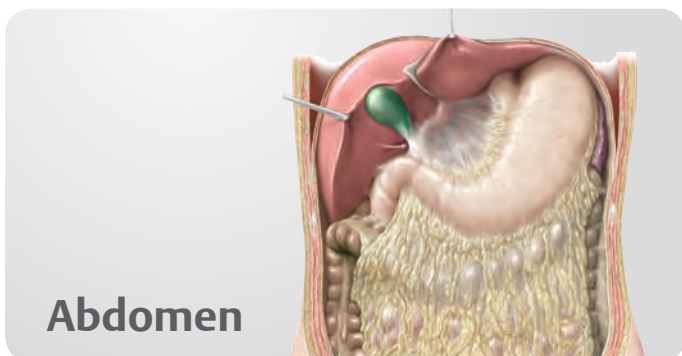
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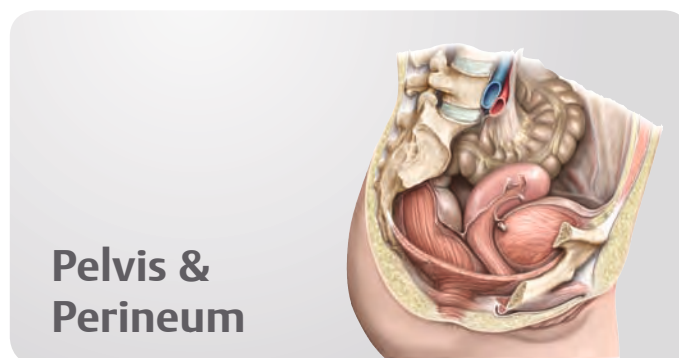
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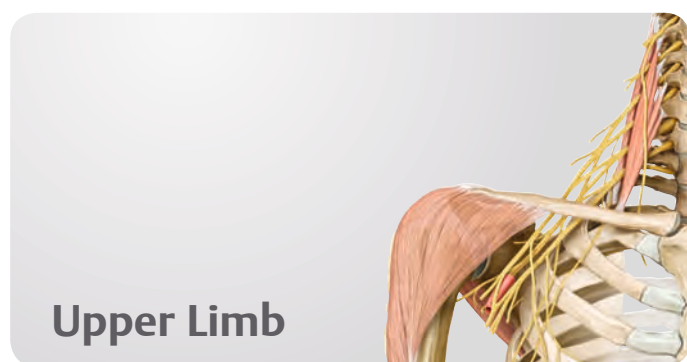
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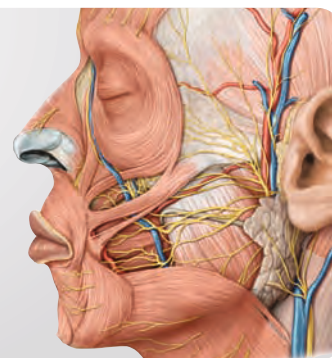
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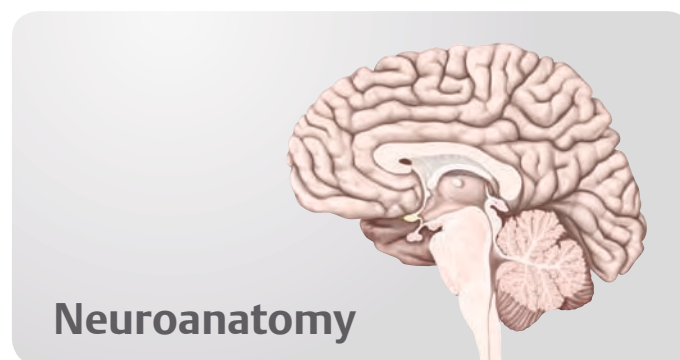
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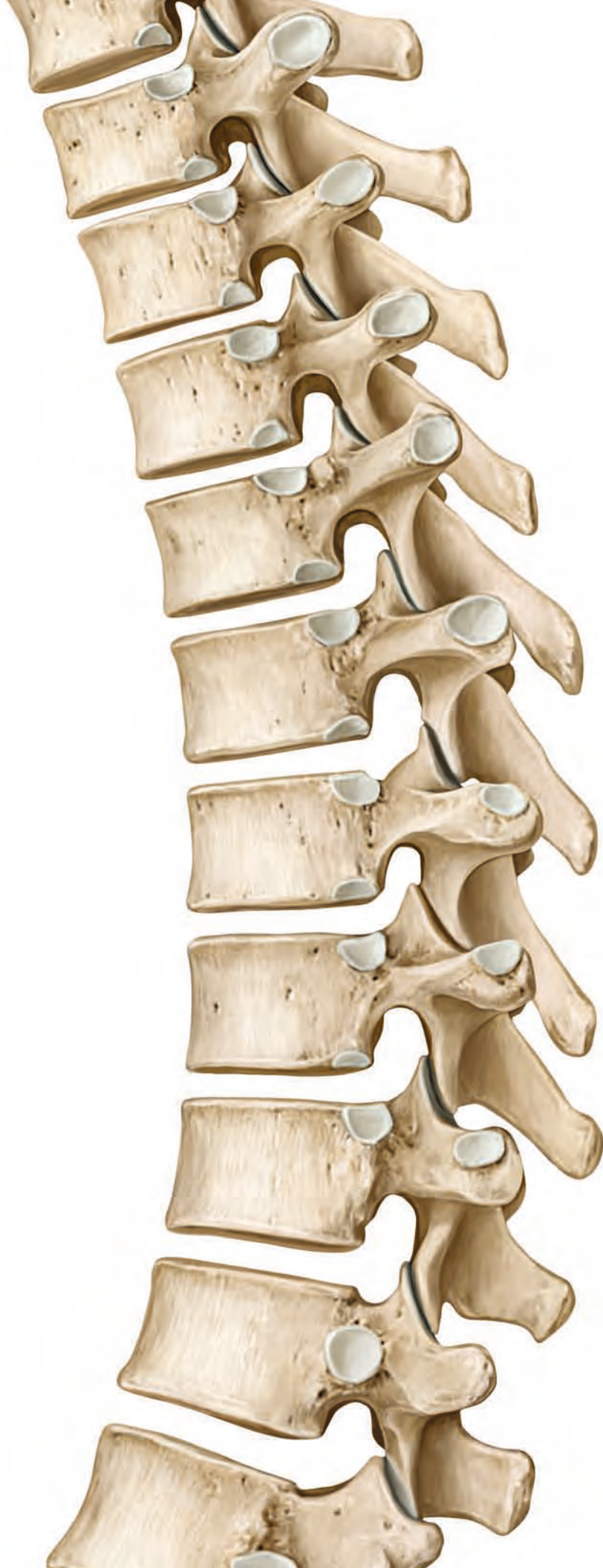
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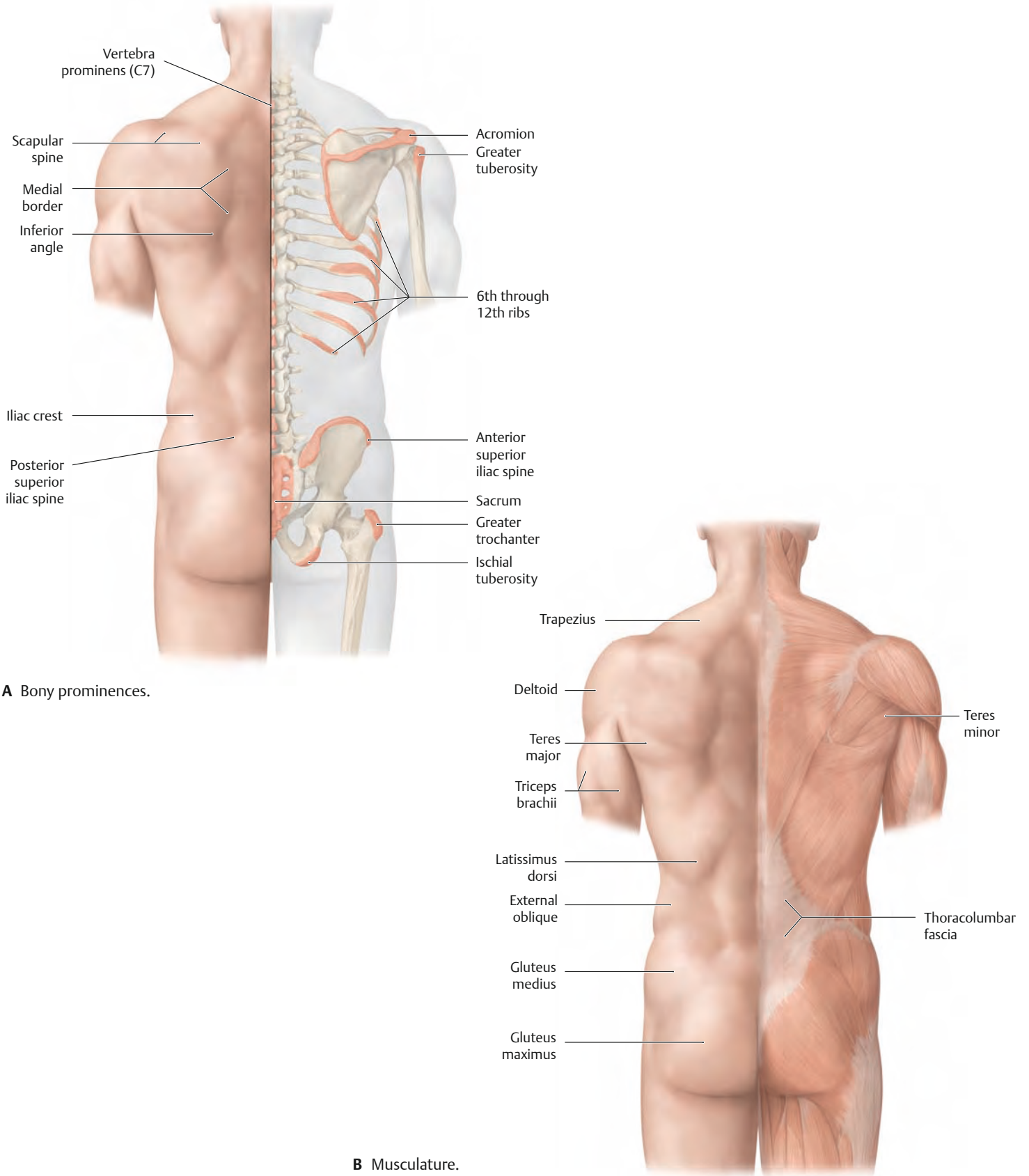
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Surface Anatomy

Fig. 1.1 Palpable structures of the back
Posterior view.



A Bony prominences.

B Musculature.

Fig. 1.2 Regions of the back and buttocks

Posterior view.

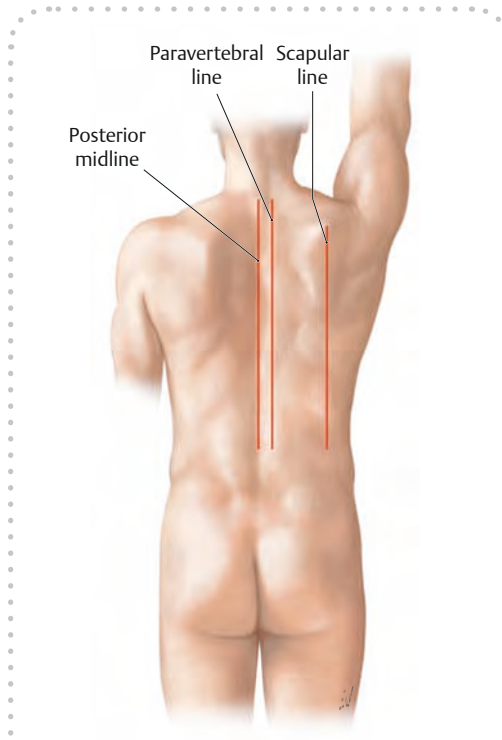
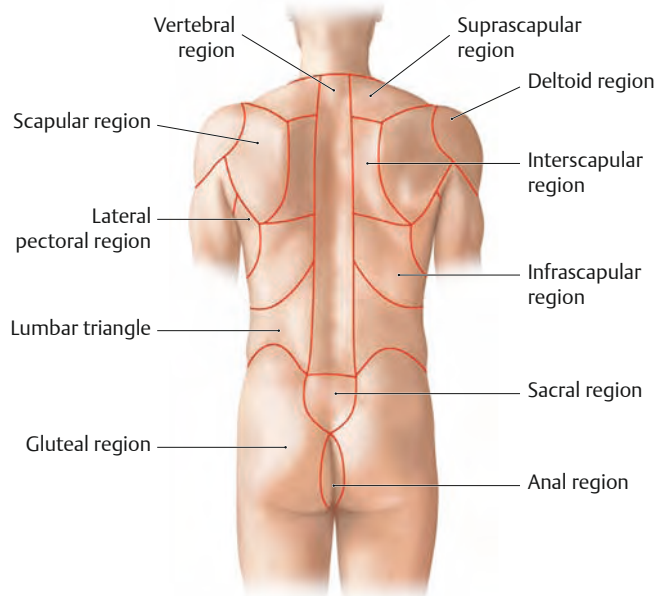


Table 1.1

Reference lines of the back

Posterior midline	Posterior trunk midline at the level of the spinous processes
Paravertebral line	Line at the level of the transverse processes
Scapular line	Line through the inferior angle of the scapula

Fig. 1.3 Spinous processes and landmarks of the back

Posterior view.

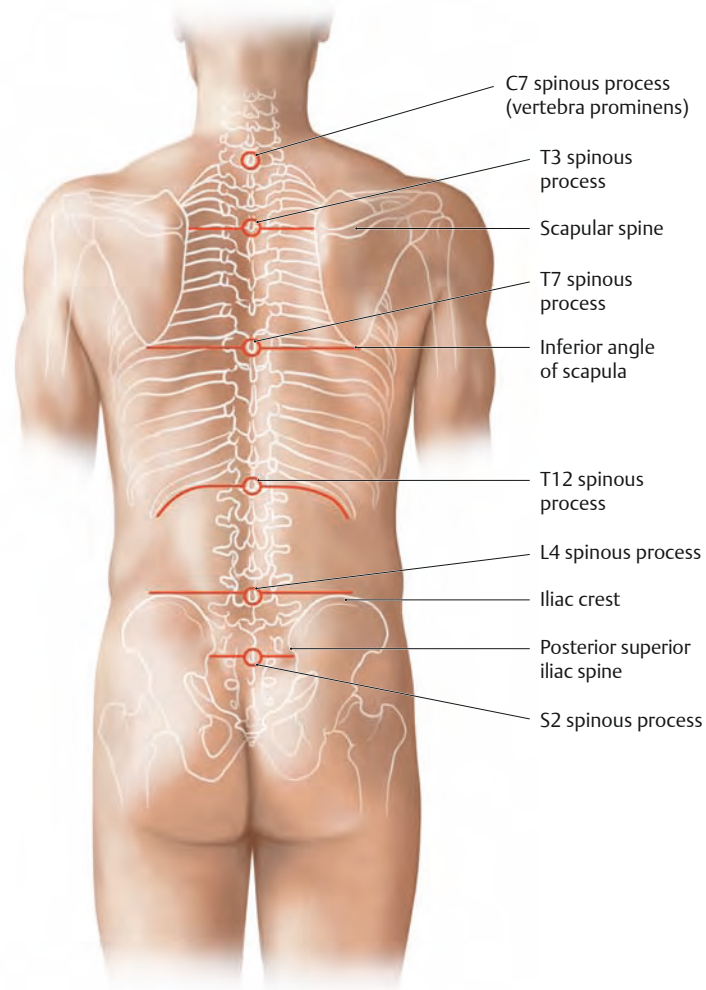


Table 1.2

Spinous processes that provide useful posterior landmarks

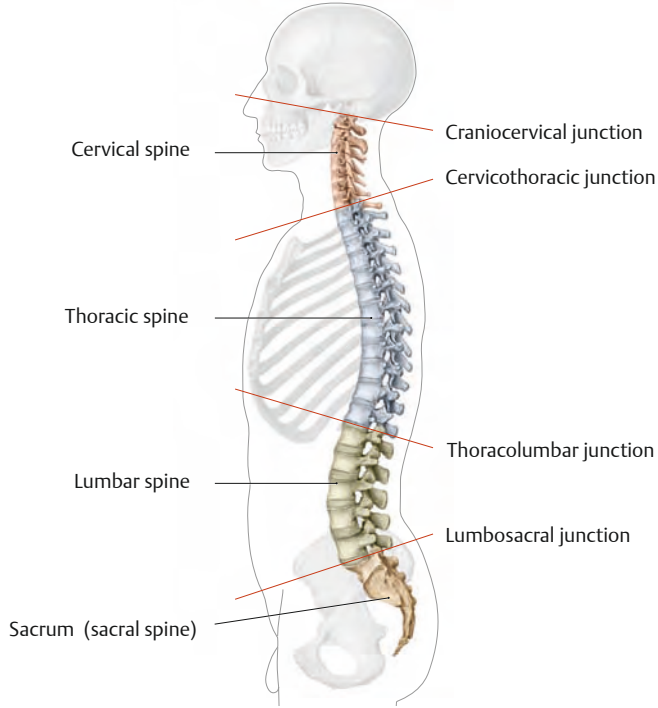
Vertebral spinous process	Posterior landmark
C7	Vertebra prominens (the projecting spinous process of C7 is clearly visible and palpable)
T3	The scapular spine
T7	The inferior angle of the scapula
T12	Just below the 12th rib
L4	The summit of the iliac crest
S2	The posterior superior iliac spine (recognized by small skin depressions directly over the iliac spines)

Vertebral Column: Overview

The vertebral column (spine) is divided into four regions: the cervical, thoracic, lumbar, and sacral spines. Both the cervical

and lumbar spines demonstrate lordosis (inward curvature); the thoracic and sacral spines demonstrate kyphosis (outward curvature).

Fig. 2.1 Vertebral column
Left lateral view.

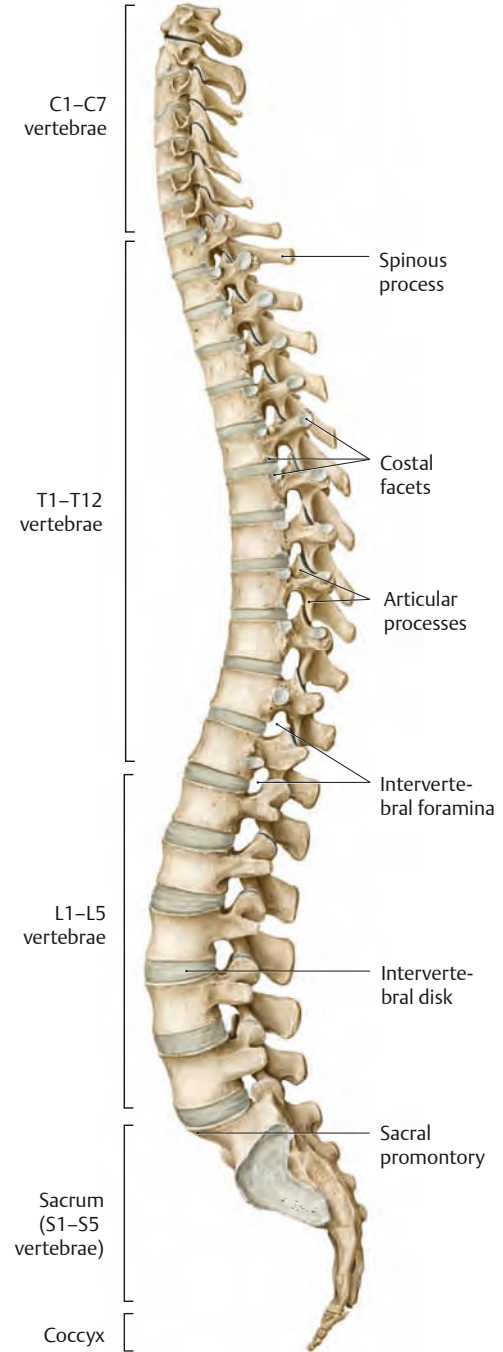


A Regions of the spine.

Clinical

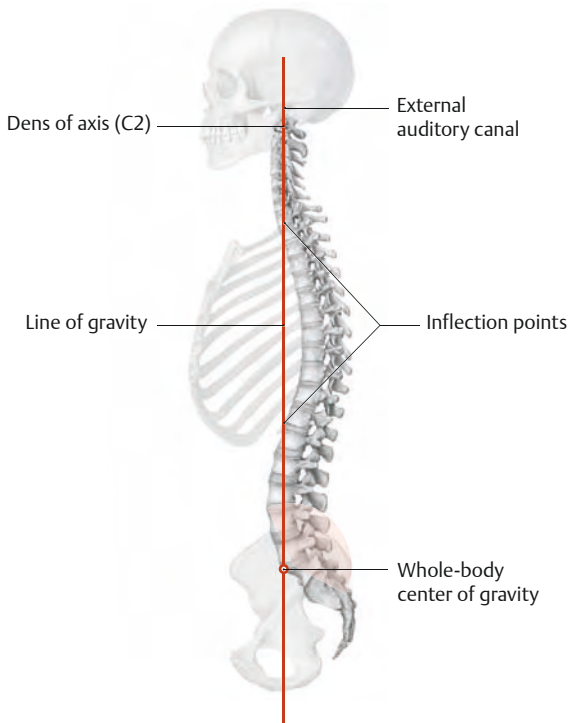
Spinal development
The characteristic curvatures of the adult spine appear over the course of postnatal development, being only partially present in a newborn. The newborn has a “kyphotic” spinal curvature (**A**); lumbar lordosis develops later and becomes stable at puberty (**C**).

This diagram illustrates the development of the spine in three stages: **A** Kyphotic spine of the newborn, showing a single outward curve; **B** Transitional phase, showing the development of cervical lordosis (inward curve) as the child begins to hold its head up; and **C** Adult spinal column, showing the fully developed spine with four distinct curves: Cervical lordosis, Thoracic kyphosis, Lumbar lordosis, and Sacral kyphosis.

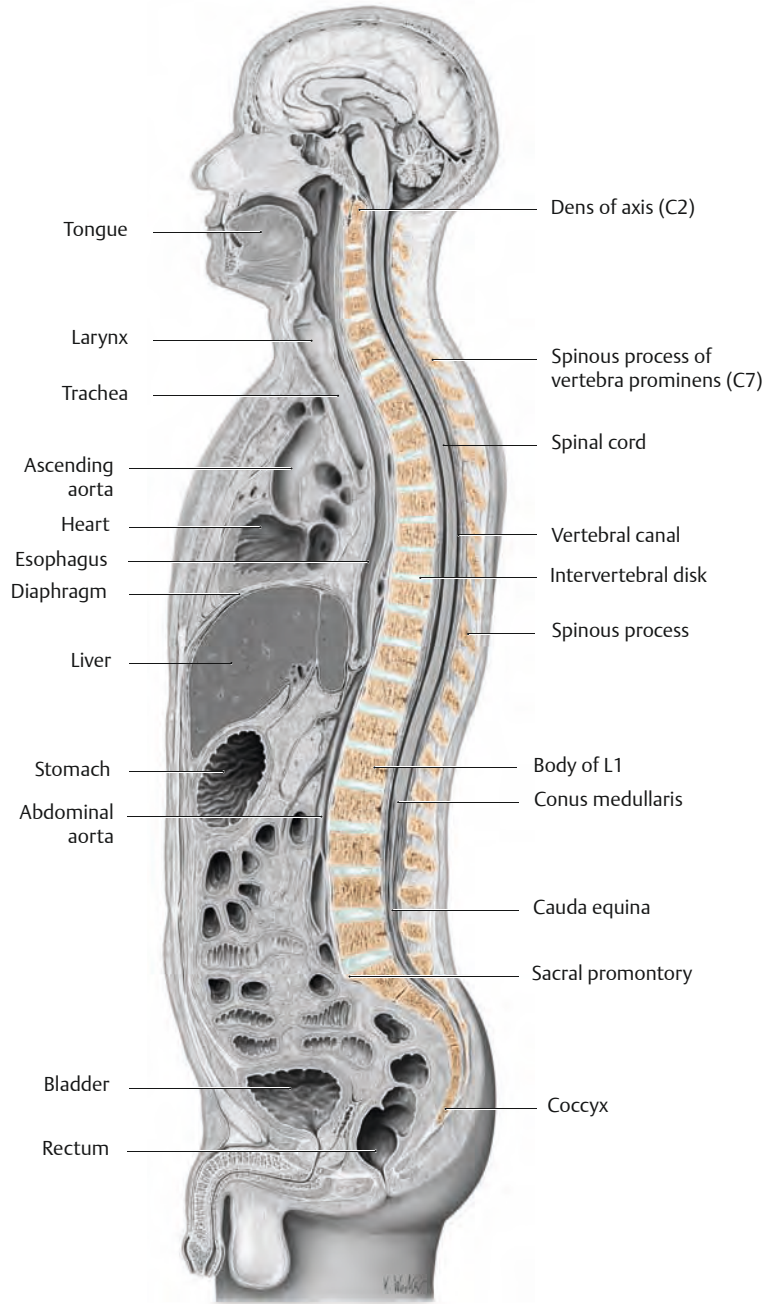


B Bony vertebral column.

Fig. 2.2 Normal anatomical position of the spine
Left lateral view.



A Line of gravity. The line of gravity passes through certain anatomical landmarks, including the inflection points at the cervicothoracic and thoracolumbar junctions. It continues through the center of gravity (anterior to the sacral promontory) before passing through the hip joint, knee, and ankle.



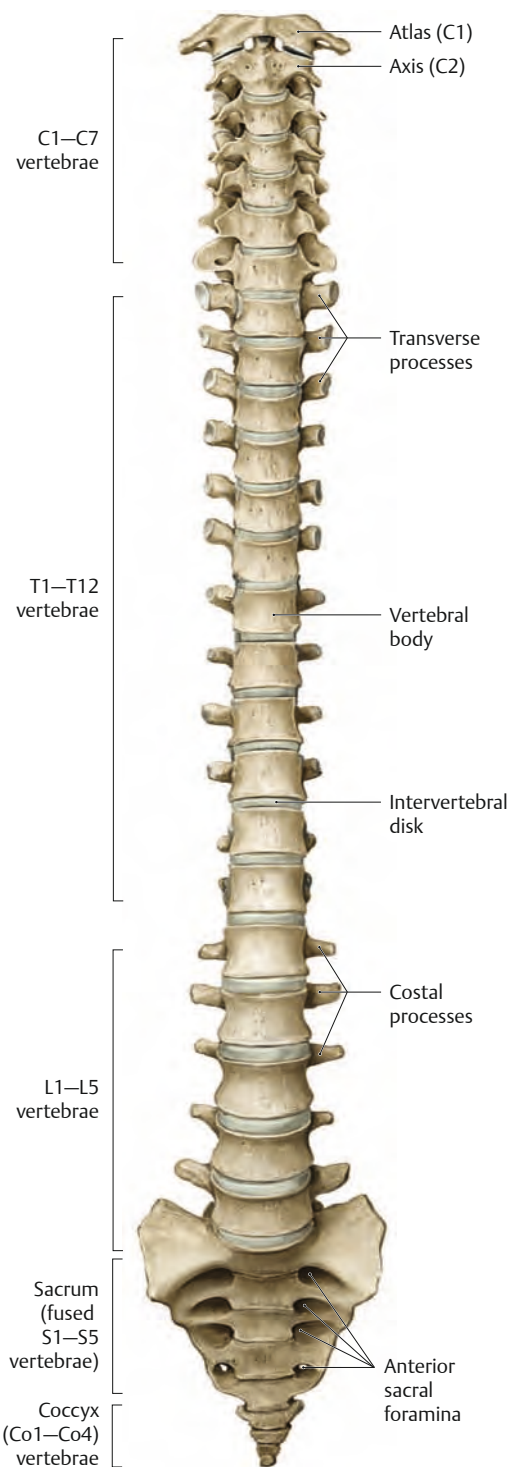
B Midsagittal section through an adult male.

Vertebral Column: Elements

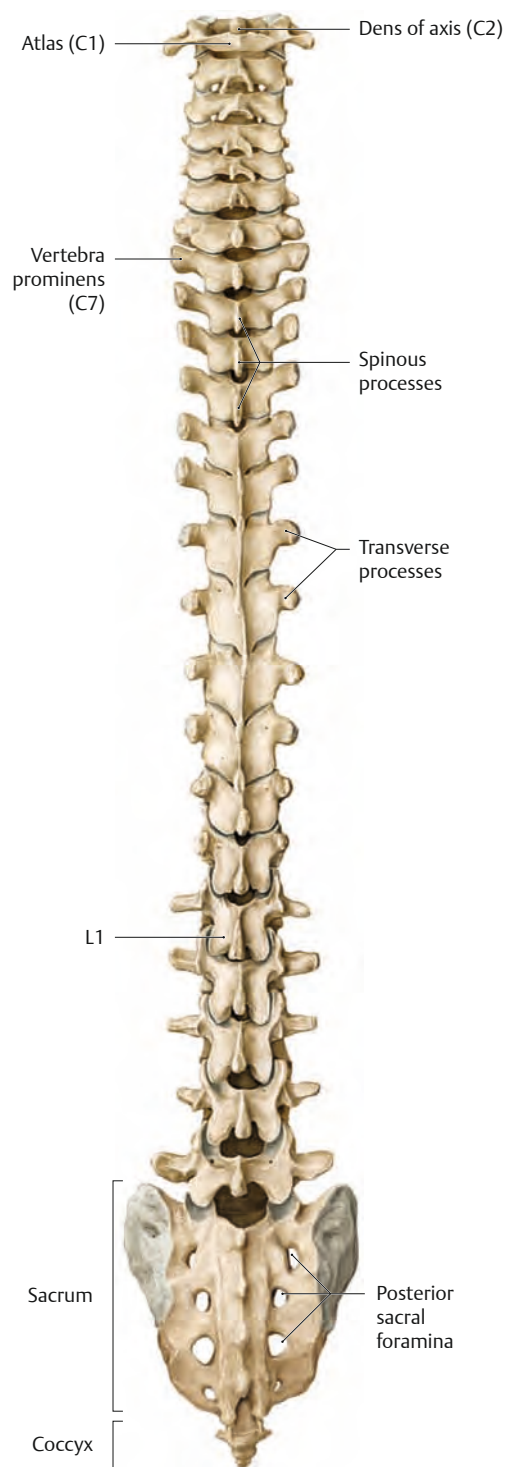
Back

Fig. 2.3 Bones of the vertebral column

The transverse processes of the lumbar vertebrae are originally rib rudiments and so are named costal processes.



A Anterior view.



B Posterior view.

Fig. 2.4 Structural elements of a vertebra

Left posterosuperior view. With the exception of the atlas (C1) and axis (C2), all vertebrae consist of the same structural elements.

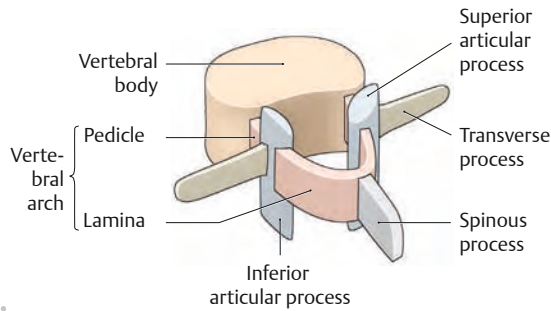
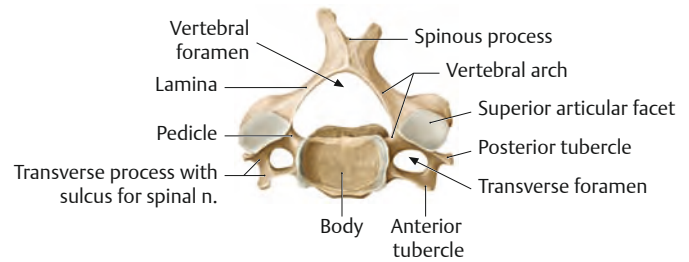
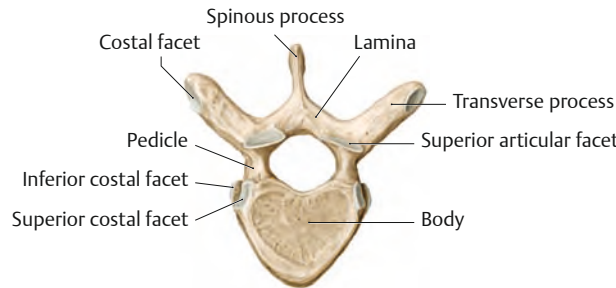


Fig. 2.5 Typical vertebrae

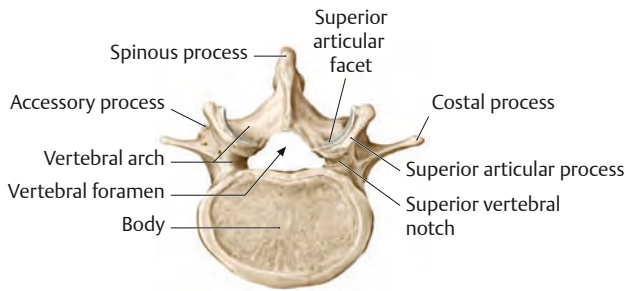
Superior view.



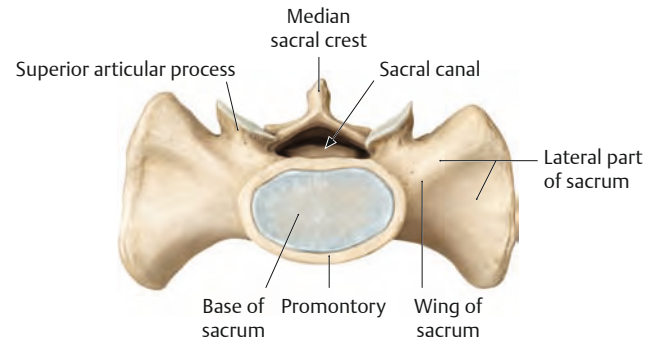
A Cervical vertebra (C4).



B Thoracic vertebra (T6).



C Lumbar vertebra (L4).



D Sacrum.

Table 2.1 Structural elements of vertebrae

Vertebrae	Body	Vertebral foramen	Transverse processes	Articular processes	Spinous process
Cervical vertebrae C3*–C7	Small (kidney-shaped)	Large (triangular)	Small (may be absent in C7); anterior and posterior tubercles enclose transverse foramen	Superoposteriorly and inferoanteriorly; oblique facets: most nearly horizontal	Short (C3–C5); bifid (C3–C6); long (C7)
Thoracic vertebrae T1–T12	Medium (heart-shaped); includes costal facets	Small (circular)	Large and strong; length decreases T1–T12; costal facets (T1–T10)	Posteriorly (slightly laterally) and anteriorly (slightly medially); facets in coronal plane	Long, sloping postero-inferiorly; tip extends to level of vertebral body below
Lumbar vertebrae L1–L5	Large (kidney-shaped)	Medium (triangular)	Called costal processes, long and slender; accessory process on posterior surface	Posteromedially (or medially) and anterolaterally (or laterally); facets nearly in sagittal plane; mammillary process on posterior surface of each superior articular process	Short and broad
Sacral vertebrae (sacrum) S1–S5 (fused)	Decreases from base to apex	Sacral canal	Fused to rudimentary rib (ribs, see pp. 52–55)	Superoposteriorly (SI) superior surface of lateral sacrum-auricular surface	Median sacral crest

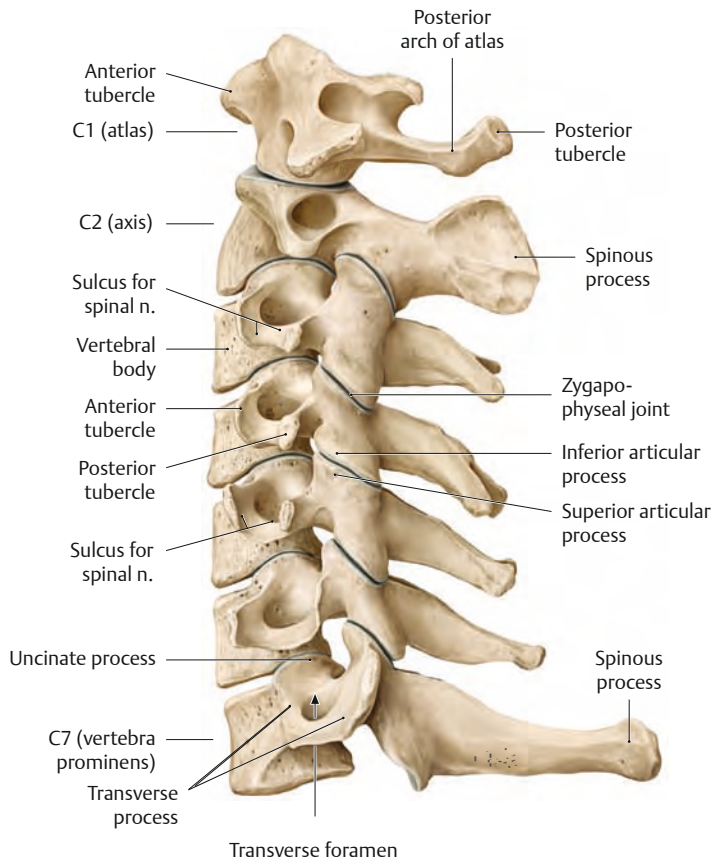
*C1 (atlas) and C2 (axis) are considered atypical (see pp. 8–9).

Cervical Vertebrae

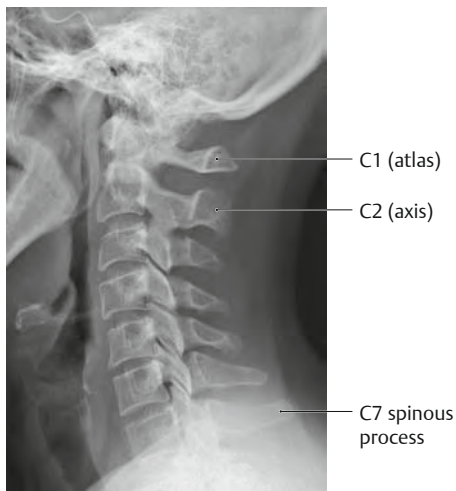
The seven vertebrae of the cervical spine differ most conspicuously from the common vertebral morphology. They are specialized to bear the weight of the head and allow the neck to move in

all directions. C1 and C2 are known as the atlas and axis, respectively. C7 is called the vertebra prominens for its long, palpable spinous process.

Fig. 2.6 Cervical spine
Left lateral view.

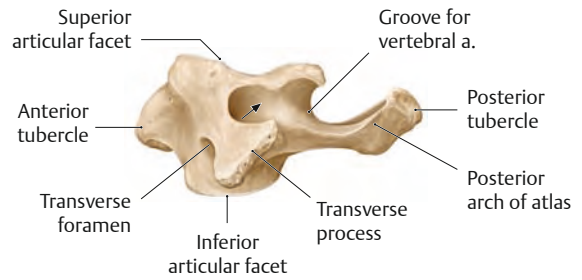


A Bones of the cervical spine, left lateral view.



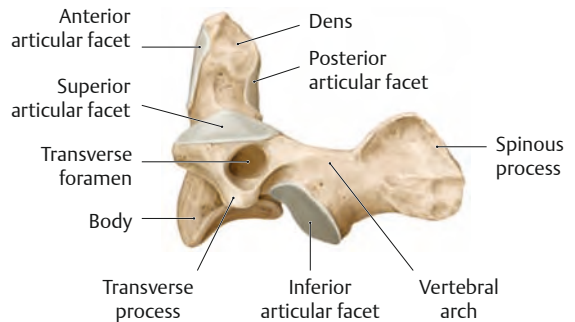
B Radiograph of the cervical spine, left lateral view.

Fig. 2.7 Atlas (C1)



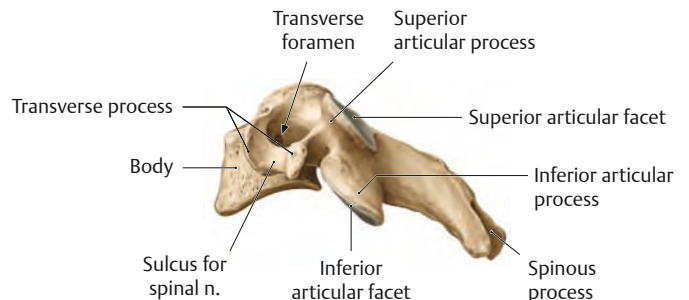
A Left lateral view.

Fig. 2.8 Axis (C2)



A Left lateral view.

Fig. 2.9 Typical cervical vertebra (C4)



A Left lateral view.