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Gross Anatomy(第7版)

Kyung Won Chung
Harold M. Chung

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Gross Anatomy

大体解剖学

精要与习题

(第7版)

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出版说明

BRS (BOARD REVIEW SERIES) 是美国医师执照考试 (USMLE) 的品牌丛书, 该系列书融知识精要、临床关联和 USMLE 题目为一体, 既有利于知识学习, 又有助于通过 USMLE 及医学相关的考试, 被众多通过 USMLE 的考生推荐为必读参考书, 并被世界多所著名医学院校选定为教学用书。

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***To Young Hee, my wife, closest friend, and companion, for her love, care,
inspiration, and encouragement.***

KWC

***To Kathie, my wife, best friend, and soul partner, and to my daughters,
Kira, Liah, and Maia, for their love, support, and understanding.***

HMC

Preface

Anatomy is the science of studying and understanding the structure and organization of the body. The art of medicine requires a strong foundation in the basic medical sciences, and anatomy is a keystone in that foundation. This concise review of human anatomy is designed for medical, dental, graduate, physician associate, nursing, physical therapy, and other health science students. It is intended to help students prepare for the United States Medical Licensing Examination (USMLE), the National Board Dental Examination, as well as other board examinations for students in health-related professions. It presents the essentials of human anatomy in the form of condensed descriptions and simple illustrations. The text is concisely outlined with related board-type questions following each section. An attempt has been made to include all board-relevant information without introducing a vast amount of material or entangling students in a web of details. Even though this book is in summary form, its content presents key elements of the full-text version with abundant clinical information. However, it is not intended to use as a primary textbook for a comprehensive study of difficult concepts and fundamentals.

ORGANIZATION

As with previous editions, the seventh edition begins with a brief introduction to the skeletal, muscular, nervous, circulatory, and organ systems. The introductory chapter is followed by chapters on regional anatomy. These include the introduction, upper limb, lower limb, thorax, abdomen, perineum and pelvis, back, and head and neck.

Once more, anatomy forms a foundation of clinical medicine and surgery and is a visual science of human structures. Thus, the success of learning and understanding largely depends on the quality of dissection and on clear, accurate illustrations. Many of the illustrations are simple schematic drawings, which are used to enhance the student's understanding of the descriptive text. A few of the illustrations are more complex, attempting to exhibit important anatomic relations. The considerable number of tables of muscles will prove particularly useful as a summary and review. In addition, the end-of-chapter summaries and summary charts for muscle innervation and action, cranial nerves, autonomic ganglia, and foramina of the skull are included in order to highlight pertinent aspects of the system.

Test questions at the end of each chapter emphasize important information and lead to a better understanding of the material. These questions also serve as a self-evaluation to help the student uncover areas of weakness. Answers and explanations are provided after the questions.

FEATURES OF THE NEW EDITION

■ Expanded and Updated Clinical Correlations

Clinical correlations emphasize the importance of anatomical knowledge by relating basic anatomy to actual medical practice. They are designed to challenge the student enhance genuine understanding of anatomy, and encourage assimilation of information. The clinical correlates are set in boxes and placed at relevant locations in the text. Many clinical correlation boxes have been edited, combined, or regrouped.

■ End-of-Chapter Summaries

These summaries help students review essential information quickly and reinforce key concepts.

■ Developmental Anatomy

The study of human embryology (normal development) and teratology (abnormal development) provides an important basis for the understanding of definitive human anatomy and is useful in guiding the students to apply the knowledge of human embryology to the clinical settings and problem-solving skills. Moreover, short summaries highlight the most important embryologic concepts in an effective, logical, and understandable way.

■ Review Test

The chapter review tests consist of questions and answers that reflect the guidelines set forth by the National Board of Medical Examiners and the current USMLE format. The questions reinforce the key information and test basic anatomic knowledge and the students' ability to interpret their observations and solve clinical problems. Therefore, clinically oriented questions and applications have been significantly increased because their fundamental utility is based on the relationship of anatomy to clinical medicine. Embryology questions are added and many test questions have been rewritten. They are centered on a clinical situation that requires in-depth anatomic knowledge and problem-solving skills. Rationales are provided for correct and incorrect answers.

■ Comprehensive Examination

As before, the comprehensive examination is placed at the end of the book. It is useful in identifying specific knowledge deficits, filling the gaps in knowledge of clinical anatomy, and serving as an independent study, review resource, and self-assessment tool in preparation for the course final and state and national board examinations.

■ Extensive Medical Art and Four-Color Illustration Program

Illustrations play critical roles in assisting students visualize anatomic structures, clarify difficult concepts, and help identify their functional and clinical characteristics. Some illustrations have been rearranged or redrawn, and new figures and images have been incorporated. Furthermore, the addition of new four-color illustrations reflects more artistic efforts, illuminates the beauty of the anatomical architecture of human tissues and organs, clarifies intricate concepts, enhances the quality and clarity of the images, and facilitates a quick recall of the text materials. Radiograms, angiograms, computed tomographic scans, and magnetic resonance images are included in the text and in the review test section, aiding the learning process of anatomic structures and their

functional and clinical relationships, and hoping to enhance the rapid diagnosis and treatment of injuries and illness of patients.

It is the authors' intention to invite feedback comments, constructive criticisms, and valuable suggestions from students and colleagues who choose this book as an aid to learning and teaching basic and clinical anatomy.

Kyung Won Chung
Harold M. Chung

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We express our sincere thanks to the many students, colleagues, and friends who have made valuable suggestions that have led to the improvement of the 7th edition. We are particularly grateful to John M. Chung, M.D. for providing his invaluable criticism of the text and clinically oriented test questions as well as for his copyediting during the preparation phases of previous and current editions. Our gratitude is also extended to Nancy Halliday, Ph. D. for her constructive suggestions, and careful and thorough reading of the final page proofs of this new edition. Finally, we greatly appreciate and enjoy the privilege of working with the Lippincott Williams & Wilkins staff, including Crystal Taylor, acquisitions editor; Stacey Sebring, managing editor; and Emilie Moyer, marketing manager. We thank the staff for their constant guidance, enthusiasm, and unfailing support throughout the preparation, production, and completion of this new edition.

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Studies of gross anatomy can be approached in several different ways including systemic, regional, or clinical anatomy. **Systemic anatomy** is an approach to anatomic study organized by organ systems, such as the respiratory, digestive, or reproductive systems, which relates structure to function. **Regional anatomy** is an approach to anatomic study based on regions and deals with structural relationships among the parts of the body, such as the thorax and abdomen, emphasizing the relationships among various systemic structures such as muscles, nerves, and blood vessels. Anatomy is best learned by emphasizing its connection to clinical medicine, and thus **clinical anatomy** emphasizes the practical application of anatomical knowledge to the solution of clinical problems and has real pertinence to the practice of medicine. In this introductory chapter, the systemic approach to the study of anatomy is used. In subsequent chapters, the clinical and regional approaches to the study of anatomy are used because many injuries and diseases involve specific body regions, and dissections and surgical procedures are performed region by region. In addition, clinical correlations are presented throughout the text.

SKELETAL SYSTEM

- Consists of the **axial skeleton** (bones of the head, vertebral column, ribs, and sternum) and the **appendicular skeleton** (bones of the extremities).

I. BONES

- Are calcified connective tissue consisting of cells (**osteocytes**) embedded in a matrix of ground substance and collagen fibers, have a superficial thin layer of **compact bone** around a central mass of **spongy bone**, and contain internal soft tissue, the **marrow**, where blood cells are formed.
- Serve as a **reservoir** for **calcium** and **phosphorus** and act as biomechanical **levers** on which muscles act to produce the movements permitted by joints.
- Are classified, according to shape, into long, short, flat, irregular, and sesamoid bones and, according to their developmental history, into endochondral and membranous bones.

A. Long Bones

- Include the humerus, radius, ulna, femur, tibia, fibula, metacarpals, and phalanges.
- Develop by replacement of hyaline cartilage plate (**endochondral ossification**).
- Have a shaft (**diaphysis**) and two ends (**epiphyses**). The **metaphysis** is a part of the diaphysis adjacent to the epiphyses.

1. Diaphysis

- Forms the **shaft** (central region) and is composed of a thick tube of **compact bone** that encloses the **marrow cavity**.

2. Metaphysis

- Is a part of the diaphysis, the growth zone between the diaphysis and epiphysis during bone development.

3. Epiphyses

- Are **expanded articular ends**, separated from the shaft by the epiphyseal plate during bone growth and composed of a **spongy bone** surrounded by a thin layer of **compact bone**.

B. Short Bones

- Include the carpal and tarsal bones and are approximately cuboid shaped.
- Are composed of **spongy bone** and **marrow** surrounded by a thin outer layer of **compact bone**.

C. Flat Bones

- Include the ribs, sternum, scapulae, and bones in the vault of the skull.
- Consist of **two layers** of **compact bone** enclosing **spongy bone** and **marrow space (diploë)**.
- Have articular surfaces that are covered with fibrocartilage and grow by the replacement of connective tissue.

D. Irregular Bones

- Include bones of mixed shapes such as bones of the skull, vertebrae, and coxa.
- Contain mostly **spongy bone** enveloped by a thin outer layer of **compact bone**.

E. Sesamoid Bones

- **Develop** in certain **tendons** and reduce friction on the tendon, thus protecting it from excessive wear.
- Are commonly found where tendons cross the ends of long bones in the limbs, as in the wrist and the knee (i.e., patella).

CLINICAL CORRELATES

Osteoblast synthesizes new bone and **osteoclast** functions in the resorption (break down bone matrix and release calcium and minerals) and remodeling of bone. Parathyroid hormone causes mobilization of calcium by promoting bone resorption, whereas calcitonin suppresses mobilization of calcium from bone. Osteoid is the organic matrix of bone prior to calcification.

Osteomalacia is a gradual softening of the bone due to failure of the bone to calcify because of lack of vitamin D or renal tubular dysfunction. **Osteopenia** is a decreased calcification of bone or a reduced bone mass due to an inadequate osteoid synthesis. **Osteoporosis** is an age-related disorder characterized by decreased bone mass and increased susceptibility to fractures of the hip, vertebra, and wrist. It occurs when bone resorption outpaces bone formation, since bone constantly undergoes cycles of resorption and formation (remodeling) to maintain the concentration of calcium and phosphate in the extracellular fluid. Signs of osteoporosis are vertebral compression, loss of body height, development of kyphosis, and hip fracture. **Osteopetrosis** is an abnormally dense bone, obliterating the marrow cavity, due to defective resorption of immature bone.

II. JOINTS

- Are places of union between two or more bones.
- Are innervated as follows: The nerve supplying a joint also supplies the muscles that move the joint and the skin covering the insertion of such muscles (**Hilton's law**).

- Are classified on the basis of their structural features into fibrous, cartilaginous, and synovial types.

A. Fibrous Joints (Synarthroses)

- Are joined by fibrous tissue, have **no joint cavities**, and permit little movement.

1. Sutures

- Are connected by fibrous connective tissue and found between the flat bones of the skull.

2. Syndesmoses

- Are connected by fibrous connective tissue.
- Occur as the inferior tibiofibular and tympanostapedial syndesmoses.

B. Cartilaginous Joints

- Are united by **cartilage** and have **no joint cavity**.

1. Primary Cartilaginous Joints (Synchondroses)

- Are united by **hyaline cartilage** and permit **no movement** but growth in the length.
- Include epiphyseal cartilage plates (the union between the epiphysis and the diaphysis of a growing bone) and sphenoccipital and manubriosternal synchondroses.

2. Secondary Cartilaginous Joints (Symphyses)

- Are joined by **fibrocartilage** and are slightly movable joints.
- Include the pubic symphysis and the intervertebral disks.

C. Synovial (Diarthrodial) Joints

- Permit a great degree of free movement and are classified according to the shape of the articulation and/or the type of movement.
- Are characterized by four features: joint cavity, articular (hyaline) cartilage, synovial membrane (which produces synovial fluid), and articular capsule.

1. Plane (Gliding) Joints

- Are united by two flat articular surfaces and allow a simple **gliding** or sliding of one bone over the other.
- Occur in the proximal tibiofibular, intertarsal, intercarpal, intermetacarpal, carpometacarpal, sternoclavicular, and acromioclavicular joints.

2. Hinge (Ginglymus) Joints

- Resemble **door hinges** and allow only flexion and extension.
- Occur in the elbow, ankle, and interphalangeal joints.

3. Pivot (Trochoid) Joints

- Are formed by a central bony pivot turning within a bony ring and allow **only rotation** (movement around a single longitudinal axis).
- Occur in the superior and inferior radioulnar joints and in the atlantoaxial joint.

4. Condylar (Ellipsoidal) Joints

- Have two convex condyles articulating with two concave condyles. (The shape of the articulation is **ellipsoidal**.)
- Allow flexion and extension and occur in the wrist (radiocarpal), metacarpophalangeal, knee (tibiofemoral), and atlantooccipital joints.

5. Saddle (Sellar) Joints

- Resemble a **saddle** on a horse's back and allow flexion and extension, abduction and adduction, and circumduction but no axial rotation.
- Occur in the carpometacarpal joint of the thumb and between the femur and patella.

6. Ball-and-Socket (Spheroidal or Cotyloid) Joints

- Are formed by the reception of a globular (ball-like) head into a cup-shaped cavity and allow movement in many directions.
- Allow flexion and extension, abduction and adduction, medial and lateral rotations, and circumduction and occur in the shoulder and hip joints.

**CLINICAL
CORRELATES**

Osteoarthritis is a noninflammatory degenerative joint disease characterized by degeneration of the articular cartilage and osseous outgrowth at the margins. It results from wear and tear of the joints; commonly affects the hands, fingers, hips, knees, feet, and spine; and is accompanied by pain and stiffness. **Rheumatoid arthritis** is an inflammatory disease primarily of the joints. It is an autoimmune disease in which the immune system attacks the synovial membranes and articular structures, leading to deformities and disability. There is no cure for rheumatoid arthritis, and its most common symptoms are joint swelling, stiffness, and pain. **Gout** is a painful form of arthritis and is caused by too much uric acid in the blood. Uric acid crystals are deposited in and around the joints, causing an inflammation and pain, heat, redness, stiffness, tenderness, and swelling of the joint tissues.

MUSCULAR SYSTEM**I. MUSCLE**

- Consists predominantly of **contractile cells**, produces the **movements** of various parts of the body by contraction, and occurs in three types:

A. Skeletal Muscle

- Is voluntary and striated; makes up approximately 40% of the total body mass; and functions to produce movement of the body, generate body heat, and maintain body posture.
- Has two attachments, an **origin** (which is usually the more fixed and proximal attachment), and an **insertion** (which is the more movable and distal attachment).
- Is enclosed by **epimysium**, a thin layer of connective tissue. Smaller bundles of muscle fibers are surrounded by **perimysium**. Each muscle fiber is enclosed by **endomysium**.

**CLINICAL
CORRELATES**

Lou Gehrig's disease (amyotrophic lateral sclerosis) is a fatal neurologic disease that attacks the neurons responsible for controlling voluntary muscles. The muscles gradually weaken and atrophy; the brain is unable to control voluntary movement of the arms, legs, and body; and patients lose the ability to breathe, swallow, and speak. The earliest symptoms may include cramping, twitching, and muscle weakness.

B. Cardiac Muscle

- Is involuntary and striated and forms the **myocardium**, the middle layer of the heart.
- Is innervated by the autonomic nervous system but contracts spontaneously without any nerve supply.
- Includes specialized myocardial fibers that form the cardiac **conducting system**.

C. Smooth Muscle

- Is involuntary and nonstriated and generally arranged in two layers, **circular** and **longitudinal**, in the walls of many visceral organs.
- Is innervated by the autonomic nervous system, regulating the size of the lumen of a tubular structure.
- Undergoes rhythmic contractions called **peristaltic waves** in the walls of the gastrointestinal (GI) tract, uterine tubes, ureters, and other organs.

II. STRUCTURES ASSOCIATED WITH MUSCLES

A. Tendons

- Are **fibrous bands** of dense connective tissue that **connect muscles to bones** or cartilage.
- Are supplied by sensory fibers extending from muscle nerves.

B. Ligaments

- Are **fibrous bands** that **connect bones to bones** or cartilage or are folds of peritoneum serving to support visceral structures.

C. Raphe

- Is the line of union of symmetrical structures by a fibrous or tendinous band such as the pterygomandibular, pharyngeal, and scrotal raphe.

D. Aponeuroses

- Are **flat fibrous sheets** or expanded broad tendons that attach to muscles and serve as the means of origin or insertion of a flat muscle.

E. Retinaculum

- Is a fibrous band that holds a structure in place in the region of joints.

F. Bursae

- Are fluid-filled **flattened sacs of synovial membrane** that facilitate movement by minimizing friction.

G. Synovial Tendon Sheaths

- Are synovial fluid-filled **tubular sacs** around **muscle tendons** that facilitate movement by reducing friction.

H. Fascia

- Is a **fibrous sheet** that envelops the body under the skin and invests the muscles and may limit the spread of pus and extravasated fluids such as urine and blood.

1. Superficial Fascia

- Is a loose connective tissue between the dermis and the deep (investing) fascia and has a **fatty superficial layer** (fat, cutaneous vessels, nerves, lymphatics, and glands) and a **membranous deep layer**.

2. Deep Fascia

- Is a sheet of fibrous tissue that **invests the muscles** and helps support them by serving as an elastic sheath or stocking.
- Provides origins or insertions for muscles, forms fibrous sheaths or retinacula for tendons, and forms potential pathways for infection or extravasation of fluids.

NERVOUS SYSTEM

I. NERVOUS SYSTEM

- Is divided anatomically into the **central nervous system** (CNS), consisting of the brain and spinal cord, and the **peripheral nervous system** (PNS), consisting of 12 pairs of cranial nerves and 31 pairs of spinal nerves, and their associated ganglia.
- Is divided functionally into the **somatic** nervous system, which controls primarily voluntary activities, and the **visceral (autonomic)** nervous system, which controls primarily involuntary activities.