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第一篇　人体解剖学

人体解剖学绪论

一、人体解剖学的概念及其在医学药学中的地位

人体解剖学是一门研究正常人体的形态、结构和器官空间位置关系的学科。弗里德里希·恩格斯说过：没有解剖学就没有医学。解剖学不但是医学的重要基础课，也是药学的基础课，因为药品的使用者是人。对药科学类专业的学生而言，获取人体解剖学的知识，能够更好地理解药物在体内如何被吸收、转化、代谢，如何发挥治疗作用，并可激发创造性的思维，为研发药物打下更好的基础。

二、人体解剖学的区分

人体解剖学一般分为大体解剖学、显微解剖学（组织学）、成长解剖学、放射解剖学和临床解剖学等。

大体解剖学又进一步分为系统解剖学和局部解剖学。系统解剖学以人体的功能系统（如运动系统、消化系统等）为研究和学习单位，逐个系统地来研究和学习人体器官的形态、位置和结构。人体分为九个系统：运动系统、消化系统、呼吸系统、泌尿系统、生殖系统、循环系统、感觉器官、神经系统和内分泌系统。

局部解剖学是在系统解剖学基础上，以区域（如胸部、腹部等）为研究和学习单位，逐个区域地来研究和学习人体器官或结构的空间位置关系。

Part One　Human Anatomy

Introduction of Human Anatomy

Ⅰ. Concept of Human Anatomy and Its Position in Medicine and Pharmaceutics

Human anatomy is the subject that studies the shape, structure and spatial ubiety of organs of normal human body. Friedrich Engels said, there is no medicine without anatomy. Human anatomy is not only the important basic curriculum of medicine, but also the basic course of pharmaceutics, because of the consumers of medicine are human being. After getting the knowledge of human anatomy, pharmaceutical students could understand better how medicines are absorbed, converted and metabolized in the body, how they play therapeutic action. This may irritate creationary thinking and establish a better base for researching and developing medicines.

Ⅱ. Division of Human Anatomy

Human anatomy is generally divided into gross anatomy, microscopic anatomy (histology), developmental anatomy, radiographic anatomy and clinical anatomy etc.

Gross anatomy is subdivided into **systematic anatomy** and **regional anatomy**. The systematic anatomy takes the functional systems of human body (such as locomotor system, alimentary system etc.) as researching and learning units, and studies the shape, location and structure of organs of the body system by system. The human body is divided into 9 systems, locomotor, alimentary, respiratory, urinary, reproductive, circulatory systems, sensory organs, nervous and endocrine systems.

The **regional anatomy** takes regions of the body (such as thorax, abdomen etc.) as researching and learning units, and studies the spatial ubiety of organs or structures of the body region by region on the base of systematic anatomy.

三、人体的分部

人体可人为地分为头、颈、躯干、上肢和下肢（图 00-01）。躯干前面的上部和下部分别称为胸部和腹部；而躯干后面的上部和下部分别称为背部和腰部。颈的后部称为项。上肢再分为肩部、臂、前臂和手；下肢再分为臀部、大腿、小腿和足。

Ⅲ. Divisions of Human Body

The **human body** is artificially divided into the **head**, **neck**, **trunk**, **upper** and **lower limbs**(Fig. 00-01). The upper and lower part of anterior aspect of trunk is respectively called **thorax** and **abdomen**, while the upper and lower part of posterior aspect of trunk is respectively called **back** and **lumbar**. The posterior part of neck is called **nucha**. The upper limb is subdivided into **shoulder**, **arm**, **forearm** and **hand**, the lower limb is subdivided into **glutea**, **thigh**, **leg** and **foot**.
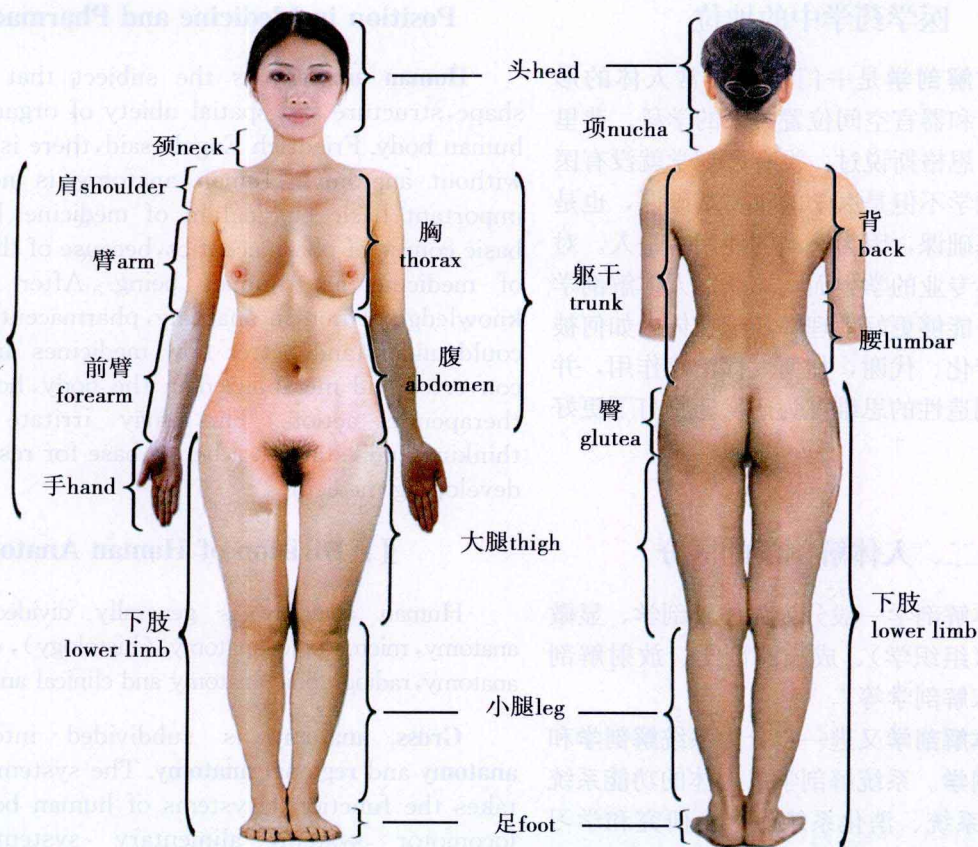
图 00-01　解剖姿势和人体的分部
Anatomic position and divisions of human body

四、解剖学常用术语

（一）解剖学姿势

身体直立，面向前，两眼平视前方；双足跟、足尖靠拢，足尖向前；上肢垂于躯干两侧，手掌向前（图 00-01）。在描述人体任何器官或结构的形态和位置时，均以此姿势为准。

Ⅳ. Common Terms of Human Anatomy

（Ⅰ）Anatomical position

The body stands up erectly, the face is directed forward, the eyes see forward horizontally. The heels and toes are closed together, the tips of feet are directed forward. The upper limbs hang by the sides of the body, the palms of hands face forward(Fig. 00-01). This position is the standard for describing the shape and location of any organ or structure of the body.

（二）解剖方位

在解剖学姿势的情况下，**前（腹侧）** 指靠近身体前面的部分；**后（背侧）** 指靠近身体后面的部分。在描述手时常用**掌侧面**代替前，用**背侧面**代替后。

上指靠近头顶的部分；下指靠近足底的部分。在躯干，有时用**颅侧**来代替上，用**尾侧**来代替下。**近侧**用于表示靠近肢体的根部或附着端的部分；而**远侧**用于表示远离肢体的根部或附着端的部分。

内侧指靠近正中矢状切面的部分；而**外侧**指远离正中矢状切面的部分。**内**用于表示靠近中空性器官的内腔或靠近体腔的部分；而**外**用于表示远离中空性器官的内腔或远离体腔的部分。**浅**指靠近体表的部分；而**深**指远离体表的部分。

（三）身体的轴

1. 矢状轴 为前后方向穿过人体的水平轴，与身体的前面垂直，与矢状面平行（图00-02）。

2. 冠状轴 为从右向左或从左向右穿过人体的水平轴，与矢状轴垂直，与冠状面平行（图00-02）。

3. 垂直轴 为上下方向穿过人体的轴，与地面垂直，与冠状轴和矢状轴互相垂直（图00-02）。

（四）相关平面

1. 矢状面，是与身体前面垂直，将人体分为左、右两部分的面。其中通过人体中线，将人体分为左、右对称两部分的面，称**正中（矢状）面**（图00-02）。

2. 冠状面，又叫**额状面**，是与矢状面垂直，将人体分为前后两部分的面（图00-02）。

3. 水平面，又叫**横切面**，与矢状面和冠状面垂直，沿水平线穿过人体，将人体分为上、下两部分的切面（图00-02）。

（Ⅱ）Anatomical Directions

On the anatomical position, **anterior （ventral）** means the part nearer the front surface of the body. **Posterior （dorsal）** means the part nearer the back surface of the body. **The palmar surface** is usually used instead of anterior, **the dorsal surface** instead of posterior in describing the hand.

Superior means the part nearer the top of head. **Inferior** means the part nearer the soles of feet. In the trunk, **cranial** is used instead of superior sometimes, and **caudal** instead of inferior. **Proximal** is used to indicate the part nearer to the root or attached end of a limb, while **distal** is used to indicate the part farther from the root or attached end of a limb.

Medial means the part nearer the median sagittal plane, whereas **lateral** means the part farther from this plane. **Internal** is used to indicate the part nearer the cavity of a hollow organ or body cavity, **external** is used to indicate the part farther from the cavity of a hollow organ or body cavity. **Superficial** means the part nearer the body surface, while **deep** means farther from the body surface.

（Ⅲ）Axes of Human Body

ⅰ. **Sagittal axis** is the horizontal axis that passes through the body anteroposteriorly, vertical to the anterior surface of the body, and parallel to the sagittal plane(Fig. 00-02).

ⅱ. **Coronal axis** is the horizontal axis which passes through the body from right to left or from left to right, vertical to the sagittal axis, and parallel to coronal plane(Fig. 00-02).

ⅲ. **Vertical axis** is the axis that passes through superoinferiorly the body, vertical to the earth surface, and vertical to the coronal and sagittal axes one another (Fig. 00-02).

（Ⅳ）Relational Planes

ⅰ. **Sagittal plane** (Fig. 00-02) is the plane vertical to the anterior surface of the body and divides the body into left and right parts. Thereinto the plane that passes through the midline of the body and divides the body into symmetrical left and right parts is called **median （sagittal）plane**(Fig. 00-02).

ⅱ. **Coronal Plane** is also called **frontal plane**, vertical to the sagittal plane, and divides the body into anterior and posterior parts(Fig. 00-02).

ⅲ. **Horizontal plane** is also called **transverse plane**. It is vertical to both the sagittal and coronal planes, passes through the body horizontally and divides the body into superior and inferior parts(Fig. 00-02).

垂直轴 vertical axis

矢状切面 sagittal plane

冠状切面 coronal plane

前 anterior

后 posterior

内 medial

外 lateral

冠状轴 coronal axis

横切面 transverse plane

矢状轴 sagittal axis
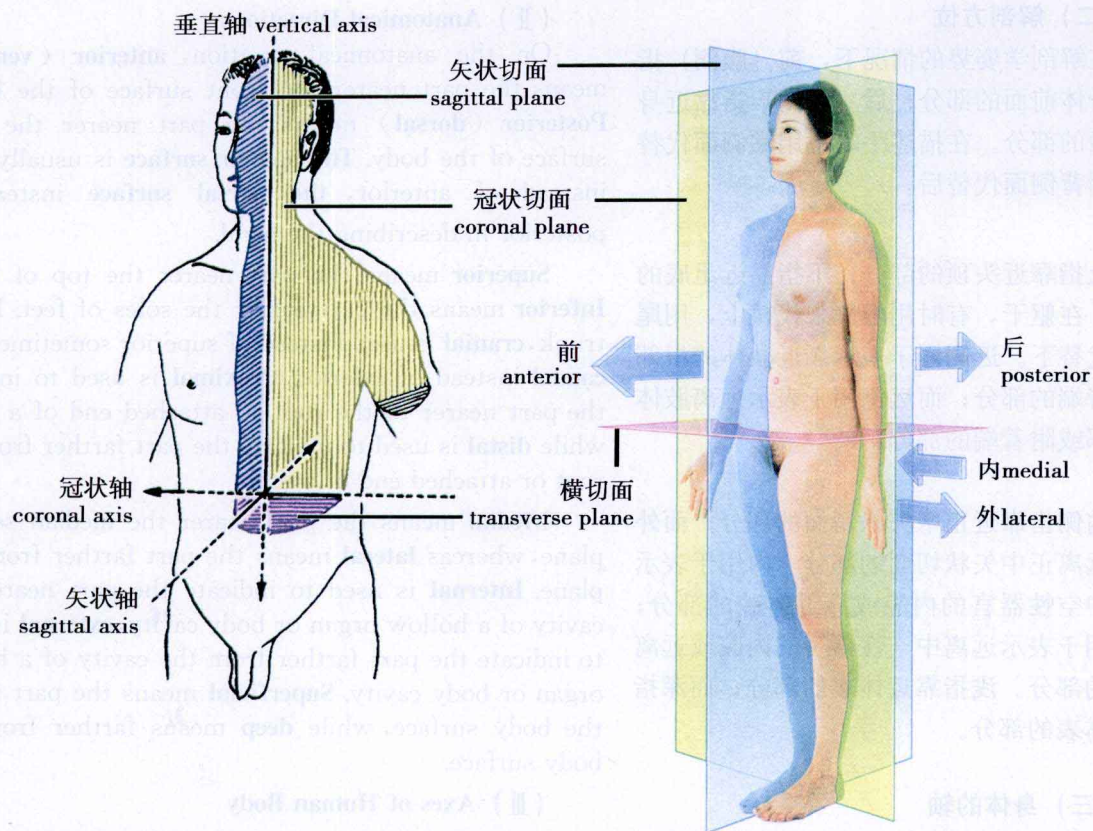
图 00-02　人体的切面、轴和解剖方位　Planes, axes and directions of human body

　　器官的切面以其本身的长轴为准。器官的横切面是与其长轴垂直的切面, 而器官的纵切面是与其长轴平行的切面。

　　The planes of an organ take the long axis of itself as the standard. The **transverse plane of an organ** is the plane vertical to its long axis, while **its longitudinal plane** is the plane parallel to the long axis.

曾明辉　张德兴

运 动 系 统

运动系统包括骨、骨连结和骨骼肌三部分。单块骨由骨连结相连形成**骨骼**。运动系统的功能包括：构成人体的骨支架、运动、保护重要器官（如脑、心脏、肺、肝等）、作为某些矿物质（如钙、磷等）的储藏库，以及造血。

第一章 骨 学

第一节 骨 学 总 论

成人有 206 块骨，可分为躯干骨、四肢骨和颅骨。

一、骨的形态和分类

按形态，人体的骨分为 4 类：长骨、短骨、扁骨和不规则骨（图 01-01）。

1. 长骨 呈长管状，分布于四肢。每块长骨由一体和两端组成。体又称骨干，含有**骨髓腔**，在活体骨上容纳**骨髓**。两端膨大，称**骨骺**，具有光滑的、由关节软骨覆盖的关节面。骨干与骨骺之间的部分称**干骺端**，在少年含有**骺软骨**。在成年后骺软骨骨化，变成**骺线**。

2. 短骨 大致呈立方形，多成群分布于腕和足，包括腕骨和跗骨。

3. 扁骨 呈板状，主要构成颅腔、胸腔和盆腔的壁，如颅盖骨和肋骨。扁骨的功能主要是保护重要的器官，如脑、心脏、肺、肝脏、脾等。

4. 不规则骨 形状不规则，包括许多颅

Locomotor System

The locomotor system includes three parts, bones, joints and skeletal muscles. The individual bones of the body are linked together by joints to form **skeleton**. The functions of the system include providing a framework for the body, movements, protecting important organs (such as brain, heart, lungs and liver etc.), serving as a storehouse of some minerals (such as calcium, phosphorus etc.) and hematopiesis.

Chapter 1 Osteology

Section Ⅰ General Description of Osteology

There are 206 bones in adults. They can be divided into bones of trunk, appendicular bones and skull.

Ⅰ. Shape and Classification of Bones

According to their shapes, the bones of human body are classified into four types: long, short, flat and irregular bones(Fig. 01-01).

ⅰ. Long Bones are tubular in shape and distributed to limbs. Each of them consists of a body and two extremities. The body is also called shaft and contains a **medullary cavity**, which lodges **bone marrow** in living bones. The extremities are wider and called **epiphyses**, and possess smooth articular surfaces covered by articular cartilage. The part between the shaft and extremity is called **metaphysis**, which contains **epiphysial cartilage** in young man. The epiphysial cartilage ossifies in adults and becomes an **epiphysial line**.

ⅱ. Short Bones are roughly cuboid in shape, distribute to wrist and foot in groups, and include carpal and tarsal bones.

ⅲ. Flat Bones are plate-like and form mainly the walls of cranial, thoracic and pelvic cavities, for example, the calvaria and ribs. Their main functions are to protect important organs, such as brain, heart, lungs, liver and spleen etc.

ⅳ. Irregular bones are greatly varied in shape

骨、椎骨、髋骨等。有些颅骨内含有充满空气的腔或窦，称含气骨，如上颌骨等。

and include many of cranial bones, vertebrae, and hip bones etc. Some cranial bones contain air-filled cavities or sinuses and are known as pneumatic bones, such as maxillae etc.

躯干骨 bones of trunk

颅骨 skull

上肢骨 bones of upper limb

b 短骨 short bone

c 不规则骨 irregular bone

d 含气骨 pneumatic bone

长骨（股骨）long bone(femur)

外板 outer plate
板障 diploe
内板 inner plate

下肢骨 bones of lower limb

胫骨 tibia

a

e 扁骨 flat bone
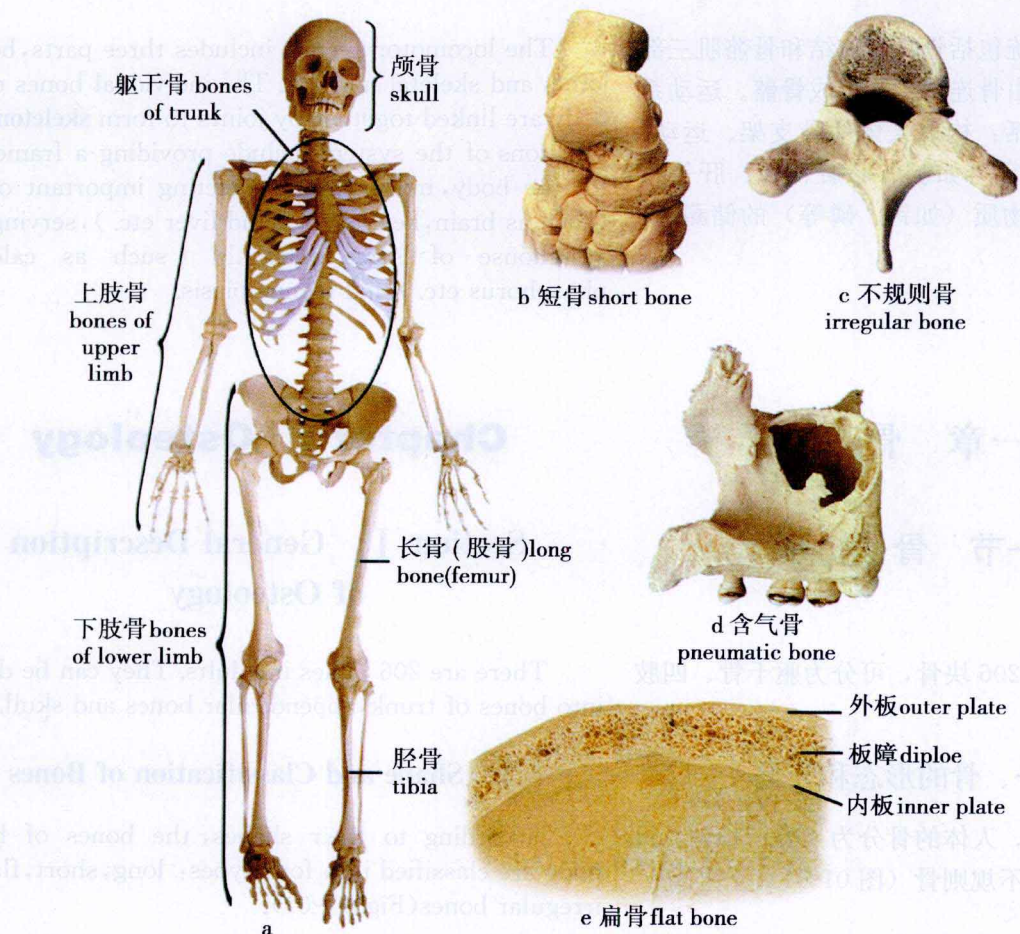
图 01-01　骨的形态和分类　Shape and classfication of bones

二、骨 的 构 造

活体骨由骨质、骨膜和骨髓构成，有丰富的血液供应和神经分布（图 01-02）。

1. 骨质　分骨密质和骨松质（海绵状骨质）。**骨密质**的质地致密，主要分布于长骨的骨干和其他骨的表面，能够抵抗压力和卷力；**骨松质**呈海绵状，分布于长骨的骨骺和其他骨的内部，由相互交织在一起的骨小梁构成。

2. 骨膜　覆盖除关节面以外的整个骨面，由纤维结缔组织构成。它可分为内、外两层。外层致密，又称**纤维膜**，由纤维结缔

Ⅱ. Structure of Bones

Living bones consist of bony substance, periosteum and bone marrow, and are abundant in blood and nerve supply(Fig. 01-02).

i. Bony Substance is divided into compact and cancellous (spongy) bones. The **compact bone** is dense, distributes mainly to the shafts of long bones and the external layer of other bones, and is capable of resisting stresses and bending. The **cancellous bone** is like sponge, distributes to the epiphyses of long bones and the interior of other bones, and consists of a lot of trabeculae interweaved each other.

ii. Periosteum covers the whole bone except articular surfaces and consists of fibrous connective tissue. It divides into an outer layer and an inner layer.

骺线epiphysial line

骨松质 spongy bone

骨髓bone marrow

骨密质 compact bone

骨膜periosteum

骨髓腔 medullary cavity

B

关节面articular surface

关节软骨articular cartilage

A
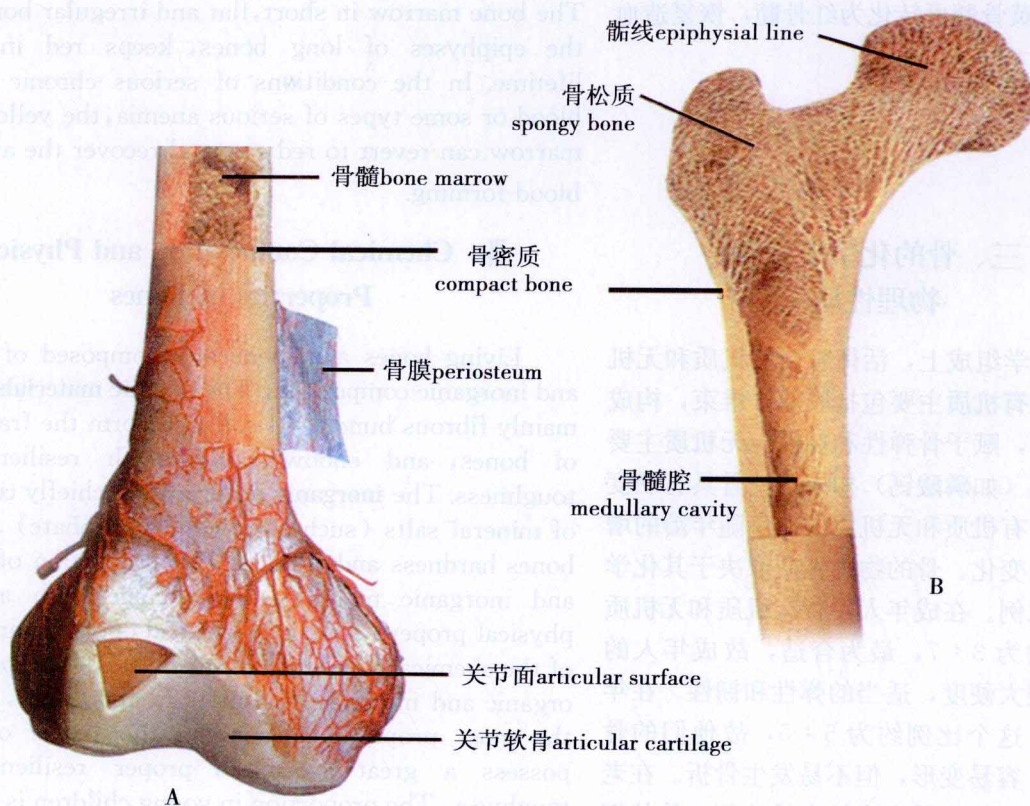
图 01-02 骨的构造 Structure of bone

组织构成；内层疏松，又称**血管膜**，衬有**成骨细胞**和**破骨细胞**，分别具有产生新骨质和吸收骨质的功能。骨膜含有丰富的血管和神经，在骨的营养、再生和修复中起重要作用。为防止骨坏死或延迟愈合，在手术中应尽可能保护骨膜。

3. 骨髓 充填于骨髓腔和骨松质的间隙内，分为红骨髓和黄骨髓两种。**红骨髓**由不同发育阶段的血细胞构成，呈红色，有造血功能；**黄骨髓**由脂肪组织构成，呈黄色，没有造血能力。胎儿和 5 岁以前幼儿的骨髓都是红骨髓。从 6 岁开始，长骨骨干内的红骨髓逐渐被黄骨髓取代。在 18 岁左右，四肢长骨骨髓腔里的红骨髓几乎都被黄骨髓取代。短骨、扁骨、不规则骨，长骨骨骺的骨髓终生都是红骨髓。在严重慢性失血或重度

The outer layer is dense and also called **fibrous membrane** and is composed of fibrous connective tissue. The inner layer is loose, also called **vascular membrane**, and is lined with the **osteoblasts** and **osteoclasts**, which have the function of forming new bony tissue and absorbing bony tissue respectively. The periosteum contains abundant blood vessels and nerves, and plays important roles in the nourishment, regeneration and repairing of bones. In order to prevent bony necrosis or delayed healing, the periosteum should be preserved as much as possible in operation.

iii. Bone marrow is filled up medullary cavities and the spaces of cancellous bone, and divided into red and yellow bone marrow. The **red bone marrow** consists of the developing blood cells of varied periods, red in colour, and is capable of making blood cells. The **yellow bone marrow** comprises fat tissue, yellow in colour, and loses the ability of blood-forming. All bone marrow of fetus and the children before 5 years is red bone marrow. By the sixth year, the red marrow in medullary cavities is gradually replaced by yellow one. At about 18th year, red bone marrow in the medullary cavities of long bones of limbs is almost replaced by yellow one.

贫血时，黄骨髓可转化为红骨髓，恢复造血功能。

The bone marrow in short, flat and irregular bones, and the epiphyses of long bones, keeps red in whole lifetime. In the conditions of serious chronic loss of blood or some types of serious anemia, the yellow bone marrow can revert to red one, and recover the ability of blood-forming.

三、骨的化学成分和物理性质

在化学组成上，活体骨由有机质和无机质组成。**有机质**主要包括胶原纤维束，构成骨的支架，赋予骨弹性和韧性。**无机质**主要由矿物盐（如磷酸钙）构成，使骨具有硬度和刚性。有机质和无机质的比例随年龄的增长而发生变化。骨的物理性质取决于其化学成分的比例。在成年人，骨有机质和无机质的比例约为 3：7，最为合适，故成年人的骨具有很大硬度，适当的弹性和韧性。在年幼儿童，这个比例约为 5：5，故他们的骨较柔软，容易变形，但不易发生骨折。在老年人，骨的无机质占有较大的比例，故他们的骨脆性较大，骨折较常见。

Ⅲ. Chemical Composition and Physical Properties of Bones

Living bones are chemically composed of organic and inorganic components. The **organic materials** include mainly fibrous bundles of collagen, form the framework of bones, and endow bones with resilience and toughness. The **inorganic materials** are chiefly composed of mineral salts (such as calcium phosphate) and give bones hardness and rigidity. The proportion of organic and inorganic materials can change with age. The physical properties of bones depend upon the proportion of the chemical components. In adults, the proportion of organic and inorganic materials is about 3/7, which is the most proper condition, so the bones of adults possess a great hardness, proper resiliences and toughness. The proportion in young children is about 5/5, so their bones are softer, easy to be deformed, but not easy to happen bone fractures. In old people, the inorganic materials share a comparatively larger proportion, so their bones have a larger fragility, bone fracture is frequent.

四、骨的发生和发育

骨大约在胚胎第 8 周发生于中胚层的间充质，有两种成骨形式：膜内成骨和软骨内成骨。

1. 膜内成骨　从胚胎第 8 周开始，中胚层的间充质先分化成膜状，在膜的基础上骨化，形成骨组织，称**膜内成骨（膜化骨）**。多数扁骨，如颅盖骨等，以这种形式形成。

2. 软骨内成骨　中胚层的间充质先分化发育成软骨雏形，再骨化形成骨组织，称**软骨内成骨（软骨化骨）**。长骨就是以此形式形成的。一些骨由单一的骨化中心发育而来，而另一些骨有两个或多个骨化中心。初级骨化中心发育成骨干，而次级骨化中心发育成骨骺。在一段时间里，骨骺和骨干被骺软骨分隔开。

Ⅳ. Development of Bones

Bones develop from mesenchyma of mesoderm at about the eighth gestational week. There are two patterns of ossification, intramembranous and intracartilaginous ossifications.

ⅰ. **Intramembranous ossification**　From the eighth gestational week, the mesenchyma of mesoderm differentiats into membranous structure at first, which then is ossified to form bone tissue. This is called **intramembranous ossification**. Most flat bones, such as calvarial bones, are formed by this pattern.

ⅱ. **Intracartilaginous ossification**　The mesenchyma of mesoderm differentiats into cartilage models at first, which then is ossified to form bone tissue. This is called **intracartilaginous ossification**. Long bones are formed in this form. Some bones develop from a single ossific center, others have two or more centers of ossification. The primary ossific centers develop to form shaft, while the secondary centers of ossification develop to form epiphysis. During a period of time, the epiphyses are

髋软骨不断发育和骨化，形成骨组织，使骨不断加长。最后，髋软骨全部骨化，变成**髋线**。髋线一旦形成，骨的长度就不会再增加。大多数髋软骨的骨化时间在18至20岁，女性比男性早1～2年。骨骼的发育在25岁全部完成。

separated from the shaft by epiphysial cartilage.

The epiphysial cartilage continues to develop and ossify to form bone tissue, which increases continuously the length of bone. Eventually the epiphysial cartilage is entirely ossified and becomes **epiphysial line**. Once the epiphysial line is formed, the length of bone does not increase any more. The ossification time of most epiphysial cartilages is from the 18th to 20th year, one or two years earlier in girls than in boys. The development of the skeleton is finished entirely in the 25th year.

曾明辉 蒋裕芸

第二节 躯 干 骨

躯干骨包括椎骨、胸骨和肋（图01-01，01-03）。

Section Ⅱ Bones of Trunk

Bones of trunk include vertebrae, sternum and ribs (Fig. 01-01, 01-03).
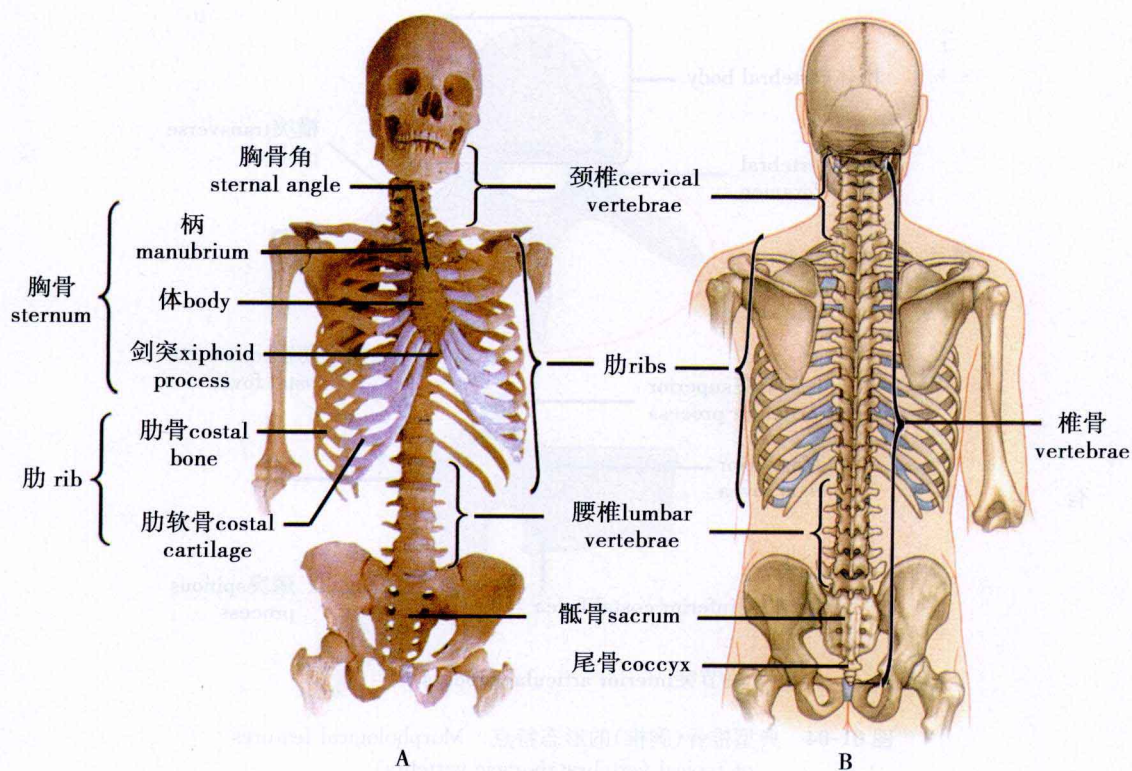
图 01-03 躯干骨 Bones of trunk

一、椎 骨

在成年以前，分离椎骨的正常数目是32或33块，包括颈椎7块，胸椎12块，腰椎5块，骶椎5块，尾椎3～4块（图01-03，01-05）。在成年人，5块骶椎相互融合成骶骨，3或4块尾椎融合成尾骨。

Ⅰ. Vertebra

In young persons, the normal number of separate vertebrae is 32 or 33, which includes 7 cervical, 12 thoracic, 5 lumbar, 5 sacral and 3 or 4 coccygeal vertebrae (Fig. 01-03, 01-05). In adults, the 5 sacral vertebrae fuse with one another to form sacrum, and the 3 or 4 coccygeal vertebrae fuse together to form coccyx.

（一）椎骨的一般形态

典型椎骨（图 01-04）由两部分组成：**椎体**和**椎弓**。椎体呈短圆柱状，与椎弓共同围成**椎孔**。各椎骨的椎孔依次贯通，构成**椎管**。椎弓通过椎弓根与椎体相连。椎弓根的上面和下面分别有**椎上切迹**和**椎下切迹**。一个椎骨的椎下切迹与相邻椎骨的椎上切迹围成一个**椎间孔**。椎间孔有脊神经和伴随的血管通过。椎弓上有 7 个突起：一个棘突，伸向后方或后下方；一对横突，伸向侧方；一对上关节突和一对下关节突（图 01-04）。

（ I ） General Shape of Vertebrae

A typical vertebra(Fig. 01-04) is made up of two parts, a vertebral body and a vertebral arch. The body is a short column in shape, which together with the arch encloses **vertebral foramen**. The vertebral foramina of all vertebrae are placed in series together to form **vertebral canal**. The arch connects with the body by a pair of pedicles of vertebral arch. The superior and inferior surfaces of the pedicle bear a superior and an inferior vertebral notches respectively. The inferior vertebral notch of a vertebra together with the superior vertebral notch of its neighbor forms an **intervertebral foramen**, by which spinal nerve and accompanying vessels pass through. There are 7 processes on the vertebral arch, a spinous process projecting posteroinferiorly or backward, a pair of transverse processes projecting laterally, a pair of superior and a pair of inferior articular processes(Fig. 01-04).
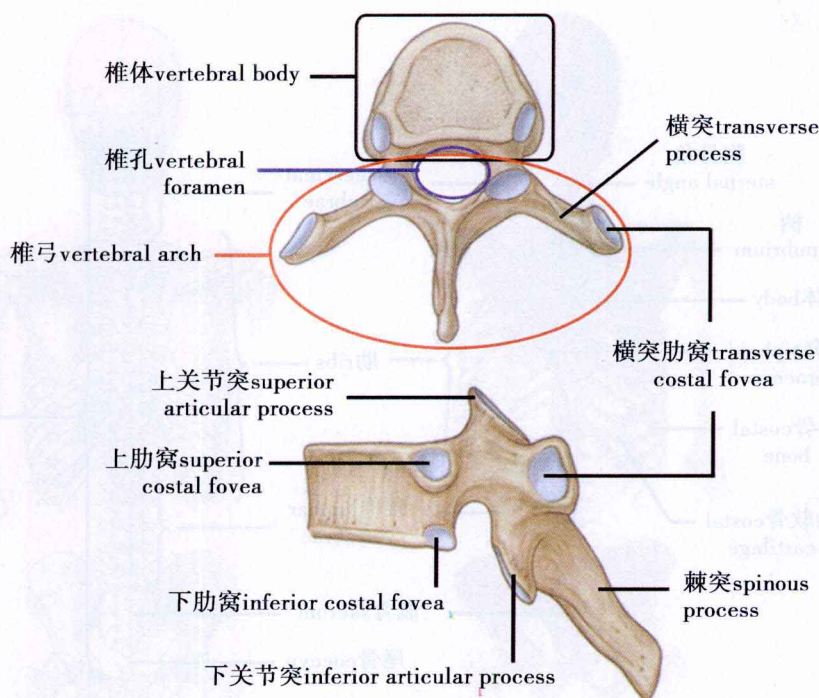
图 01-04　典型椎骨（胸椎）的形态特点　Morphological features of typical vertebra(thoracic vertebra)

（二）各部椎骨的主要特征

1.胸椎　在椎体侧面后部有上肋凹和下肋凹，在横突末端的前面有横突肋凹（图 01-04）。胸椎的棘突较长，斜向后下方，其关节突的关节面几乎呈冠状位（图 01-05）。

（ II ） Main Features of Vertebrae in Each Region

ⅰ. **Thoracic Vertebrae**　have a superior and an inferior costal foveae on the posterior part of their bodies, a transverse fovea on the anterior surface of their transverse process tip(Fig. 01-04). Their spinous processes are long and slope posteroinferiorly. The articular facets of their articular processes are almost in coronal planes(Fig. 01-05).

齿突窝dental fovea
齿突dens
c 寰椎atlas
d 枢椎axis
横突孔transverse foramen
棘突spinous process
e 隆椎vertebra prominens
f 典型颈椎typical cervical vertebra
椎体vertebral body
棘突spinous process

a 脊柱前面 anterior aspect of spinal column

b 脊柱后面posterior aspect of spinal column

g 典型腰椎typical lumbar vertebra

颈椎 cervical vertebrae
胸椎 thoracic vertebrae
腰椎 lumbar vertebrae
骶骨 sacrum
尾骨coccyx

图 01-05 椎骨的分部和各部椎骨的特点 Divisions of vertebrae, features of each division

2. 颈椎（图 01-05） 在横突上有横突孔，横突末端分叉成前、后两个结节，第 2～6 颈椎的棘突较短，末端分叉。上、下关节突的关节面几乎呈水平位。第 3～7 颈椎体上面侧缘向上突起，称椎体钩。第 1 颈椎（寰椎）无椎体和棘突，呈环状，由前弓、后弓及两个侧块组成，前弓后面正中有齿突凹。第 2 颈椎（枢椎）的椎体上面有齿突，与寰椎齿突凹相关节。第 7 颈椎又名隆椎，棘突较长，不分叉，体表容易触及。

3. 腰椎（图 01-05） 椎体较大，棘突宽而短，粗壮，呈方形的板状，水平伸向后方。它们关节突的关节面几呈矢状位。

4. 骶骨（图 01-05） 由 5 块骶椎融合而

ii . Cervical Vertebrae（Fig. 01-05） have transverse foramina in their transverse processes. The ends of the transverse processes are bifurcated into anterior and posterior tubercles. The spinous processes from the second to the sixth are short and bifid in extremities. The articular facets of superior a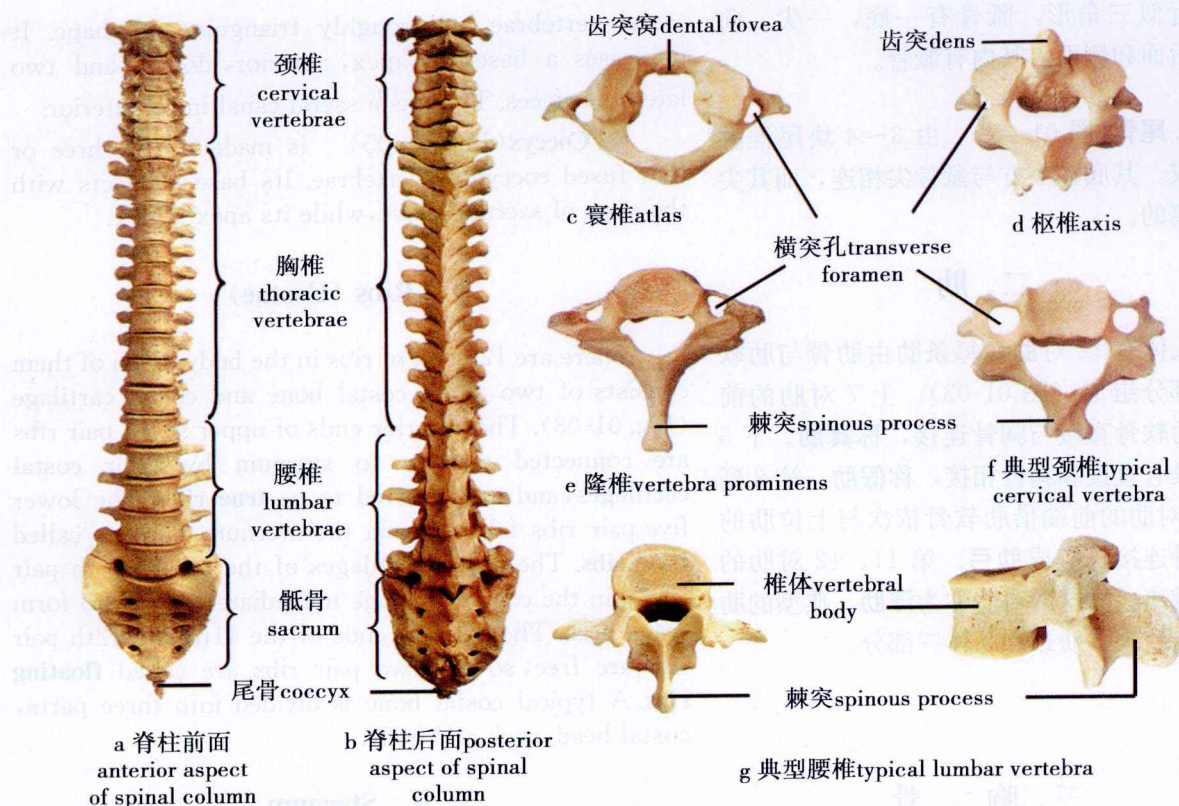nd inferior articular processes are almost in horizontal plane. The lateral margins of the vertebral bodies from the third to the seventh project upward, which are called uncus of vertebral body. The first cervical vertebra（atlas）has no body and no spinous process. It is ring-shaped and consists of anterior and posterior arches and two lateral mass. There is a fovea dentis at the middle of posterior surface of the anterior arch. The second cervical vertebra（axis）bears the odontoid process（dens）on the superior aspect of its body，which articulates with the fovea dentis of atlas. The seventh cervical vertebra is also called vertebra prominens. Its spinous process is relatively long，not bifid，and can be easily felt.

iii . Lumbar Vertebrae（Fig. 01-05） have larger vertebral bodies. Their spinous processes are wide, short, strong, square in shape, and project backwards horizontally. The articular facets of their articular processes are almost in sagittal plane.

iv . Sacrum（Fig. 01-05） is made up of five fused

成，近似三角形。骶骨有一底，一尖，前面，后面和侧面，其内有骶管。

5. 尾骨（图 01-05）　由 3～4 块尾椎融合而成。其底在上方与骶骨尖相连，而其尖是游离的。

sacral vertebrae and roughly triangular in shape. It possesses a base, an apex, anterior, dorsal, and two lateral surfaces. There is a sacral canal in its interior.

ⅴ. **Coccyx**（Fig. 01-05）　is made up of three or four fused coccygeal vertebrae. Its base connects with the apex of sacrum above, while its apex is free.

二、肋

人体有 12 对**肋**，每条肋由肋骨与肋软骨两部分组成（图 01-03）。上 7 对肋的前端借肋软骨直接与胸骨连接，称**真肋**。下 5 对肋没有直接和胸骨相接，称**假肋**。第 8 到第 10 对肋的前端借肋软骨依次与上位肋的肋软骨连接，形成**肋弓**。第 11、12 对肋的前端游离，故这两对肋称为**浮肋**。典型的肋骨包括肋头、肋颈和肋体三部分。

三、胸　骨

胸骨位于胸前壁正中，属于扁骨，分为胸骨柄、胸骨体和剑突三部分（图 01-03）。胸骨柄与胸骨体连接处，形成微向前突的**胸骨角**。胸骨角即使在肥胖者也容易被触摸到。它的两侧与第 2 肋相连，是临床上计数肋和肋间隙的重要标志。

Ⅱ. Ribs（Costae）

There are 12 pairs of ribs in the body. Each of them consists of two parts, costal bone and costal cartilage (Fig. 01-03). The anterior ends of upper seven pair ribs are connected directly to sternum by their costal cartilages, and are referred to as **true ribs**. The lower five pair ribs fail to reach the sternum, and are called **false ribs**. The costal cartilages of the 8th to 10th pair ribs join the costal cartilage immediately above to form **costal arch**. The anterior ends of the 11th and 12th pair ribs are free, so the two pair ribs are called **floating ribs**. A typical costal bone is divided into three parts, costal head, neck and body.

Ⅲ. Sternum

Sternum is located in the middle of anterior thoracic wall, and belongs to flat bone. It is divided into manubrium, body and xiphoid process(Fig. 01-03). The junction between the manubrium and body projects forwards slightly to form **sternal angle**, which can be easily palpated even if in obese. The lateral sides of the angle are articulated with the second ribs, so it is an important landmark for counting the order of ribs and intercostal spaces in clinic.

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第三节　四 肢 骨

Section Ⅲ　Bones of Limbs

一、上 肢 骨

上肢骨分为肩（上肢）带骨和自由上肢骨两部分。

Ⅰ. Bones of Upper Limbs

The bones of upper limbs are divided into two parts, shoulder girdle and the bones of free upper limbs.

（一）肩（上肢）带骨
肩带骨包括锁骨和肩胛骨。

1. 锁骨（图 01-06）　呈 "S" 形弯曲，从胸骨延伸到肩胛骨的肩峰，将上肢和躯干连接起来。

（Ⅰ）Shoulder(Upper Limbs) Girdle
The bones of shoulder girdle include clavicle and scapula.

ⅰ. **The clavicle**（Fig. 01-06）　is S-shaped. It extends from the sternum to the acromion of scapula and joins the bones of trunk with those of upper limb.

2. 肩胛骨（图 01-06） 为三角形扁骨，贴于胸廓后外面。可分三缘（内侧缘、外侧缘和上缘）、三个角（上角、下角和外侧角）和二面（前面或肋面和后面或背侧面）。

ⅱ. **The scapula**（Fig. 01-06） is a triangular flat bone situated on the posterolateral aspect of thorax. It has three borders（the medial, lateral and superior borders）, three angles（the superior, inferior and lateral angles）, and two surfaces（the anterior or costal and posterior or dorsal surfaces）.

锁骨胸骨端 sternal end of clavicle
锁骨肩峰端 acromial end of clavicle
喙突 coracoid process
肩胛上角 superior angle of scapula
肩胛上角 superior angle of scapula
肩胛切迹 scapular notch
喙突 coracoid process
肩峰 acromion
关节盂 glenoid cavity
冈上窝 suprascapular fossa
肩胛下窝 infrascapular fossa
外侧缘 lateral border
肩胛冈 spine of scapula
内侧缘 medial border
冈下窝 infraspinous fossa
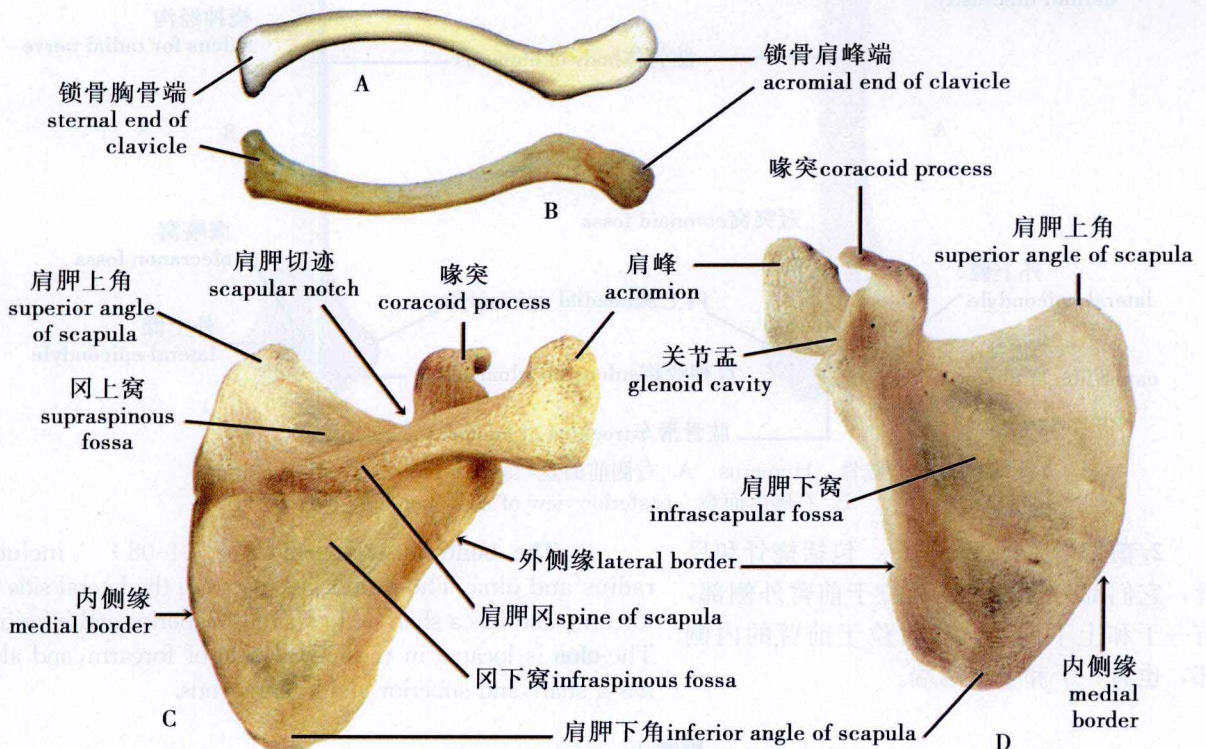肩胛下角 inferior angle of scapula
内侧缘 medial border

图 01-06 锁骨和肩胛骨 Clavicle and Scapula A. 右侧锁骨上面观 superior view of right clavicle B. 右侧锁骨下面观 inferior view of right clavicle C. 右侧肩胛骨后面观 posterior view of right scapula D. 右侧肩胛骨前面观 anterior view of right scapula

（二）自由上肢骨

自由上肢骨包括臂骨（肱骨），前臂骨（桡骨和尺骨）和手骨。

1. 肱骨（图 01-07） 为上臂骨，是最长最大的上肢骨，分一体及上、下两端。上端有**肱骨头**，与肩胛骨的关节盂相关节。肱骨体中部的前外侧面和后面分别有**三角肌粗隆**和**桡神经沟**。肱骨的下端宽而扁，其外侧的**肱骨小头**和内侧的**肱骨滑车**，分别与桡骨头和尺骨的滑车切迹形成关节。滑车后面上方有较深的**鹰嘴窝**。肱骨下端的外侧和内侧分别有**外上髁**和**内上髁**。

（Ⅱ）Bones of Free Upper Limb

The bones of free upper limbs include the bones of arm（humerus）, forearm（radius and ulna）and hand.

ⅰ. **The humerus**（Fig. 01-07） is the bone of arm, and is the longest and largest bone of the upper limb. The humerus has a body and two ends, superior and inferior. The upper end is the **humeral head** for articulating with the glenoid cavity of scapula. There is a **deltoid tuberosity** and a **sulcus for radial nerve** on the anterolateral surface and posterior surface of the middle part of its body respectively. The lower end of humerus is wide and flattened. The lateral **humeral capitulum** and medial **trochlea of humerus** is respectively articulated with radial head and the trochlear notch of ulna. A deep olecranon fossa lies above the trochlea posteriorly. The **lateral** and **medial epicondyles** are on each side of the lower end.