



医学英语自学丛书



解剖学



上海外语教育出版社

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英 汉 对 照

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孙建民、张培华等翻译

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序 言

为适应广大医务工作者及读者的需要，我们从医学基础和临床英语教材及参考书中挑选了一些章节译成汉语并附加注释，编译成一套《医学英语自学丛书》。该《丛书》能帮助高等和中等医学院校学生和毕业不久的临床医师掌握常用英语词汇、通晓医学科技书籍的一般句型结构，从而提高他们阅读英语原著能力和增加医学专业的知识。

《解剖学》选译自英国杰克·约瑟夫教授所著的“Essential Anatomy”中的九章。在翻译中，我们力求保持原著的文字特色，但又照顾到医学专业汉语的习惯用词和表达方式。阅读时，读者可参照医学院校的解剖学教材。

编 者

一九八三年六月

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(1) The Locomotor System⁽¹⁾ I

This system consists of the skeleton,⁽²⁾ joints⁽³⁾ and muscles.⁽⁴⁾ The skeleton and muscles more or less give the body its shape, although fat⁽⁵⁾ between the skin⁽⁶⁾ and the underlying muscle alter the contours of the body, and the contents of a cavity, such as the thoracic⁽⁷⁾ and abdominal⁽⁸⁾ cavities,⁽⁹⁾ influence the shape of the thorax and the abdomen. The presence of joints, defined simply as the various unions between bones, allows one bone to move on another and these movements are brought about by muscles. The contraction of muscles and the co-ordination of movements are examples of how impossible it is to separate one system from another. Properly functioning vascular and nervous systems are essential for correct muscle function.

The skeleton

A knowledge of the human skeleton makes it possible to understand more easily the arrangement of the rest of the tissues and organs of the body since the bones or parts of the bones are frequently used as points or areas of reference. The skeleton provides the body with rigidity, allows movement because of its many parts, affords protection in many sites, is a storehouse of calcium⁽¹⁰⁾ and has blood-forming functions. The skeleton is usually divided into the *axial*⁽¹¹⁾ (*vertebrae*,⁽¹²⁾ *skull*,⁽¹³⁾ *ribs*⁽¹⁴⁾ and *sternum*⁽¹⁵⁾) and the *appendicular*⁽¹⁶⁾ (*pectoral* and *pelvic girdles* and *limb bones*).

THE VERTEBRAL COLUMN. The *vertebrae* in man usually number 33 which are divided into 7 *cervical*,⁽¹⁷⁾ 12 *thoracic* (*dorsal*), 5 *lumbar*,⁽¹⁸⁾ 5 *sacral*⁽¹⁹⁾ (forming one bone, the *sacrum*), and 4 *coccygeal*⁽²⁰⁾ (forming the *coccyx*). A typical

vertebra has an anterior cylindrical part, the *body*, which becomes larger from above downwards. This is associated with the transmission of the weight of the body to the pelvis and lower limbs. Between the bodies are *intervertebral discs*⁽²¹⁾ of fibrocartilage which are firmly attached to the adjacent bodies' surfaces. Behind the body is the *vertebral arch*⁽²²⁾ which together with the back of the body encloses the *vertebral canal*.⁽²³⁾

The part of the vertebral arch passing backwards and laterally from the upper part of each side of the back of the body is called the *pedicle*.⁽²⁴⁾ It is usually rounded. The posterior part of the arch which passes backwards and medially on each side is called the *lamina*.⁽²⁵⁾ It is usually flattened. Projecting backwards from the back of the vertebral arch, in the midline, is the *spinous process*⁽²⁶⁾ (*spine*), projecting laterally, one on each side are the *transverse processes*⁽²⁷⁾ and projecting upwards and downwards from the sides of the arch at the junction of the pedicles and laminae are the two *superior articular processes*⁽²⁸⁾ and the two *inferior articular processes*.⁽²⁹⁾ Usually the front of the inferior articular process of the vertebra above articulates with the back of the superior process of the vertebra below. A *costal process*⁽³⁰⁾ also develops laterally in relation to the side of the body and the front of the transverse process but only in the thoracic region does it become a *rib*. Normally there are no ribs in the other regions of the axial skeleton.

When looked at from the side, an opening between two adjacent vertebrae can be seen. It is bounded by the bodies in front, by the pedicles above and below and the articulation between the articular processes behind. This is called the *intervertebral foramen*.⁽³¹⁾ Through it runs a spinal nerve⁽³²⁾.

An articulated vertebral column if looked at from the side has a forward curve⁽³³⁾ in the cervical region, a backward curve⁽³⁴⁾ in the thoracic, and a forward curve in the lumbar. In a fetus *in utero*⁽³⁵⁾ there is only a backward curve for the whole of the vertebral column. The forward curve of the neck

region is associated with the child's holding its head up at about six weeks, and the forward curve of the lumbar region with the child's sitting up and standing at about six months to a year.

A cervical vertebra is distinguishable because its transverse process has a hole (foramen) in it (*foramen transversarium*).⁽³⁶⁾ Associated with the articulations of the ribs with the bodies of the thoracic vertebrae, these are facets⁽³⁷⁾ on the bodies of the thoracic vertebrae and thus thoracic vertebrae can be identified. Lumbar vertebrae have neither foramina transversaria nor facets for the ribs.

There are other differences between the vertebrae such as the increasing size of the body from above downwards already referred to. The spine varies. It is bifid⁽³⁸⁾ in most of the cervical vertebrae, long and downward projecting in the thoracic and square and horizontal in the lumbar.

The first cervical vertebra is known as the *atlas*⁽³⁹⁾ and consists of a ring of bone without a body. It articulates above with the base of the skull and below with the second cervical vertebra, called the *axis*.⁽⁴⁰⁾ The body of the axis projects upwards to form the *dens* (*odontoid process*)⁽⁴¹⁾ which represents the body of the atlas.

The sacrum⁽⁴²⁾ is triangular in shape with the apex below. On either side it has a wide area for articulation with the hip bone.⁽⁴³⁾ Below the articulation it tapers⁽⁴⁴⁾ fairly quickly. It is easy to identify various parts of individual vertebrae in the sacrum but the coccyx⁽⁴⁵⁾ shows few of these.

The vertebral canal contains the spinal cord and its coverings (*meninges*),⁽⁴⁶⁾ the origins of the spinal nerves, blood vessels and some fat. The spinal cord extends downwards as far as the lower border of the first lumbar vertebra but the roots of the spinal nerves continue downwards to the lowest part of the vertebral canal.

The bodies of the vertebrae consist of an outer covering

of compact bone⁽⁴⁷⁾ and inner cancellous⁽⁴⁸⁾ bone in the meshes of which there is red bone marrow. The bodies of the vertebrae form a very important site for the formation of blood cells. Associated with this is a large opening on the back of the body of a vertebra, especially the lumbar vertebrae, out of which emerges a large vein which joins a venous plexus⁽⁴⁹⁾ in the vertebral canal.

THE SKULL. The *skull* consists of the *cranium*⁽⁵⁰⁾ (the head and face) and the *mandible*⁽⁵¹⁾ (lower jaw). The cranium has an upper box-like part containing the brain and a front lower part consisting of the facial skeleton. All the bones of the skull are firmly united to each other in the adult except for the *mandible*, which is fairly freely movable. The skull may be regarded as consisting of a number of cavities. The brain lies in the largest of these. Two cavities, one on each side of the skull above and in front, are called the *orbits*⁽⁵²⁾ and contain the eyeball⁽⁵³⁾ and its muscles, vessels and nerves. Between and below the orbits is the *nasal cavity*,⁽⁵⁴⁾ divided into two by a vertical septum. This cavity constitutes the beginning of the *respiratory system* but also contains the nerves associated with the sense of smell (*olfaction*). Below the nasal cavity is the *mouth* although this is not seen as a cavity of the skull itself. The mouth is the beginning of the *alimentary system*, communicates with the respiratory system and contains the nerves associated with the sense of *taste*. Many of the bones of the skull have air-containing⁽⁵⁵⁾ cavities communicating with the nasal cavities and the *ear* lies in a cavity in a bone (*temporal*)⁽⁵⁶⁾ in the base of the skull.

The skull from in front. The main bones which can be seen from the front of the skull are the *frontal bone*⁽⁵⁷⁾ above, with a vertical part forming the forehead and a horizontal part dividing into two and forming the roof of each orbit, the *zygomatic* (cheek) *bones*⁽⁵⁸⁾ forming the lateral wall of the orbit and articulating above with the frontal bone of each side, and

the *maxillae*,⁽⁵⁹⁾ one on each side of the midline below the zygomatic bone. They form the floor of the orbit and the lateral boundary of the nasal opening, and articulate with the frontal bone above to complete the margin of the orbit. Medial to the upper part of the maxillae are the *nasal bones* ⁽⁶⁰⁾ which meet in the midline and complete with the maxillae the margin of the nasal opening. Below the nasal opening the two maxillae meet and complete the upper alveolar arch containing the teeth.

The skull from the side. From the side, the upper part of the cranium (the *vault* ⁽⁶¹⁾ of the skull) comprises from in front backwards the *frontal*, *parietal* and *occipital bones*.⁽⁶²⁾ There are two parietal bones meeting in the midline above in the *sagittal suture*.⁽⁶³⁾ The transverse articulation between the frontal bone and parietal bones is called the *coronal suture*⁽⁶⁴⁾ and that between the parietal and occipital bones the *lambdoid suture*.⁽⁶⁵⁾ The occipital bone extends into the base of the skull behind. In front of the occipital bone and below the parietal bone is part of the *temporal bone* which also extends into the base of the skull in front of the occipital bone. The *sphenoid bone* ⁽⁶⁶⁾ lies in front of the temporal bone and extends into the base of the skull in front of the temporal bone. The temporal bone articulates above with the parietal bone and behind with the occipital. The sphenoid bone on the side of the skull articulates with the parietal bone above and the zygomatic bone in front. The latter bone and the maxilla can be seen on the side of the skull in front. There is a forward projection from the temporal bone just in front of the opening for the ear (*external auditory meatus*).⁽⁶⁷⁾ This meets the zygomatic bone and forms the *zygomatic arch*. This arch is easily felt in the living subject and if followed forward leads to the zygomatic bone forming the projection of the cheek. Between the arch and the surface of the skull is the *temporal fossa*.⁽⁶⁸⁾ Behind and below the opening for the ear is a downwardly

projecting piece of bone (*mastoid process*)⁽⁶⁹⁾ which is part of the temporal bone.

The skull from below. On the inferior aspect of the skull the occipital bone is seen at the back. In it, in the midline, is the large *foramen magnum*,⁽⁷⁰⁾ a communication between the inside of the skull and the vertebral canal. On either side of the foramen magnum nearer the front are the *occipital condyles*⁽⁷¹⁾ which articulate with the upper surfaces of the atlas. In front of the foramen magnum a narrow part of the occipital bone fuses with the body of the sphenoid bone which extends laterally and forwards on both sides to where it bends upwards at a right angle to form part of the temporal fossa seen deep to the zygomatic arch. Laterally between the occipital bone behind and the sphenoid in front and articulating with both is the *petrous part* of the temporal bone passing medially and forwards. It is continuous with the mastoid process. In front of the external auditory meatus is a hollowed-out area called the *mandibular fossa*. The *jugular foramen* is an opening between the temporal and occipital bones. Projecting downwards and forwards from the temporal bone medial to the mastoid process is the *styloid process*⁽⁷²⁾ which is about 2.5 cm long and 3 mm wide. In the midline in front of the body of the sphenoid is the vertically placed *vomer*⁽⁷³⁾ forming part of the septum of the nasal cavity. The lateral boundary of the nasal cavity is a downwardly projecting part of the sphenoid bone called the *pterygoid process*⁽⁷⁴⁾ which has two backwardly projecting plates of bone, the *lateral and medial pterygoid plates*. The floor of the nasal cavities (*palate*) is formed mainly by the maxillae and to some extent behind by the *palatine bones*.⁽⁷⁵⁾ The hard palate is bounded by the alveolar arch formed by the maxillae. Foramina can be seen in the midline of the palate near the front and at each posterolateral angle.

The inside of the skull. The interior of the base of the skull consists of the frontal bone in front, the sphenoid bone

in the middle and the occipital bone behind. The temporal bone is wedged⁽⁷⁶⁾ laterally between the sphenoid and occipital bones. There is a gap in the frontal bone in the midline and in the gap are the *cribriform plates*⁽⁷⁷⁾ and *crista galli*⁽⁷⁸⁾ of the *ethmoid bone*.⁽⁷⁹⁾ There are many small holes in the horizontal⁽⁸⁰⁾ cribriform plates. The crista galli is in the midline and consists of a projecting piece of bone flattened⁽⁸¹⁾ from side to side. The upper surface of the body of the sphenoid is hollowed out and forms the *sella turcica*.⁽⁸²⁾ A sagittal groove can be seen in or near the midline of the vault of the skull passing backwards from the crista galli and lying in the frontal, parietal and occipital bones. At the posterior end of the vault about 5 cm above the foramen magnum this *sagittal sulcus* turns to the right as a rule and becomes the *transverse sulcus* on the occipital bone. There is a transverse sulcus on the left which is continuous with a sulcus passing upwards in the midline from the foramen magnum. The transverse sulcus turns downwards and medially, and grooves the temporal bone. It ends at the jugular foramen.

The mandible. The mandible forms the skeleton of the lower jaw and in it are the lower teeth. It consists of a horizontal anterior horseshoe-shaped⁽⁸³⁾ part, the *body*, and on each side a posterior vertical part, the *ramus*.⁽⁸⁴⁾ The body has internal and external surfaces and upper and lower borders. In the midline in front is the *symphysis menti*⁽⁸⁵⁾ where the two halves, from which the mandible developed, are united. There is a protuberance⁽⁸⁶⁾ on the lower half of the external surface of the symphysis. About 2.5 cm from the symphysis on either side is an opening, the *mental foramen*,⁽⁸⁷⁾ midway between the upper and lower borders. On the internal surface running somewhat downwards and forwards is the *mylohyoid line*.⁽⁸⁸⁾ Above this line the body of the mandible is in the floor of the mouth; below it, the body lies in the neck. The ramus is quadrangular in shape. The *angle* of the mandible is where the

posterior border meets the inferior border. There are two upward projections on the superior border. The anterior is called the *coronoid process*⁽⁸⁹⁾ which is triangular with the apex pointing upwards. It lies deep to the zygomatic arch when the mouth is closed. The posterior is called the *condyloid process*⁽⁹⁰⁾ and is enlarged transversely above to form the *head* which articulates with the mandibular fossa in the base of the skull. If a finger is placed in the external auditory meatus the head can be felt moving forwards and backwards when the mouth is opened and closed. Near the middle of the internal surface of the ramus there is an opening called the *mandibular foramen*⁽⁹¹⁾ leading to the *mandibular canal* in which lies the nerve supplying the lower teeth.

The hyoid bone.⁽⁹²⁾ The hyoid bone is often described with the skull. It can be felt in the uppermost part of the neck just below the level of the lower border of the mandible. It consists of a *body* in the middle (about 4—5 cm wide and 1 cm high), two *greater horns* one on each side projecting backwards from the body and two *lesser horns*⁽⁹³⁾ projecting upwards and backwards from the junction of the body with the greater horns.

The growth of the skull. Broadly speaking, the vault of the skull ossifies⁽⁹⁴⁾ in membrane and the base in cartilage. The main face bones ossify in membrane. At birth the head forms a much greater proportion of the total body length than in the adult (about one quarter as compared with an eighth). Within the skull itself there are also marked differences. In an infant the facial skeleton is a much smaller proportion of the front of the head than in the adult. From the upper border of the orbit to the lower edge of the jaw is about one-half of the height of the skull in the newborn. In an adult it is about two-thirds. This change is due to the growth of the maxilla and mandible associated with the eruption of the teeth, and the growth of the space in the maxilla and enlargement of the nasal

cavity. The orbits are much larger proportionately at birth than in the adult.

At birth the bones of the vault of the skull are separated by fibrous tissue and their edges are not serrated. Growth of the skull takes place at the edges. There is also growth by the addition of bone to the outside of the skull and removal from the inside. There are large areas of fibrous tissue in certain places especially in the sagittal suture where the frontal bone meets the parietal bones. This is diamond-shaped and is called the *anterior fontanelle*.⁽⁹⁵⁾ It closes between eighteen months and two years. The growth of the skull is most rapid in the first year of life and stops at about sixteen years.

The temporal bone shows marked changes in a child's early years. At birth the external auditory meatus is shallow, so that the tympanic membrane (ear-drum) is near the surface, and the mastoid process has not yet developed. These bones grow in the first five years of life.

There is some growth of the maxilla and mandible during the eruption of the milk teeth but growth is much more marked while the permanent teeth are appearing between six and fourteen years of age. At birth the angle between the ramus and body of the mandible is obtuse and in the adult it is nearly a right angle.

THE THORACIC CAGE. The skeleton of the *thorax* consists of the thoracic vertebrae and intervertebral discs behind, the ribs posteriorly, laterally and anteriorly and the *costal cartilages*⁽⁹⁶⁾ and *sternum*⁽⁹⁷⁾ in front. The sternum is in the mid-line in front and the costal cartilages extend from the anterior ends of the ribs to the sternum, as a rule. The sternum is a flattened bone about 12.5 cm long and 4 cm wide. It consists of an upper part, the *manubrium*⁽⁹⁸⁾ (about one-third of its length), a middle part, the *body*, and a small lower part, the *xiphoid process*⁽⁹⁹⁾. The manubrium is roughly quadrilateral in shape and the medial ends of the clavicle (collar bone) and first

costal cartilage articulate with its upper lateral angle. The manubrium articulates below with the body at the *manubriosternal joint* ⁽¹⁰⁰⁾ and the transverse line of articulation can be felt as a projecting ridge. This is called the *sternal angle*. The second costal cartilage articulates with the sternum opposite the manubriosternal joint. The lowest costal cartilage to articulate with the sternum is the seventh. The sternum is a good example of a flat bone and consists of compact bone outside and cancellous bone on the inside. Since it is just under the skin it is used for obtaining samples of red bone marrow (*sternal puncture*). ⁽¹⁰¹⁾

There are twelve ribs on each side. They form a series of obliquely placed bony arches. The first rib is less oblique than the others and the eighth is the most oblique. Each rib articulates posteriorly by means of its *head* with the bodies of two neighbouring vertebrae and anteriorly with its costal cartilage through which it articulates with the sternum (first to seventh costal cartilage) or with the costal cartilage above (eighth with seventh, ninth with eighth, tenth with ninth). The exceptions are the costal cartilages of the eleventh and twelfth ribs which end freely in the abdominal wall (*floating ribs*). The first to the seventh ribs are called *true* and the eighth to the tenth *false*. Next to the head of a rib is a narrow part called the *neck* and then there is a projection posteriorly called the *tubercle*. ⁽¹⁰²⁾ About 5—6 cm lateral to the tubercle a typical rib suddenly bends forwards at the *angle* and forms the *shaft* which is flattened from side to side so that the rib has external and internal surfaces and upper and lower borders. The *costal groove* is seen on the lower half of the internal surface of the shaft. The anterior end of a rib articulates with a costal cartilage. The medial articulations of the costal cartilages with the sternum or with each other have already been considered.

The thorax as a whole is roughly conical in shape with a relatively small *inlet* ⁽¹⁰³⁾ above and a much larger *outlet* ⁽¹⁰⁴⁾

below. The inlet is kidney-shaped and is bounded by the first thoracic vertebra behind, the first rib laterally and the manubrium in front. It is oblique so that anteriorly it is at the level of the second thoracic vertebra. The inferior opening (outlet) of the thorax is bounded by the twelfth thoracic vertebra, the twelfth and eleventh ribs and the costal cartilages of the tenth to the seventh ribs. The plane of the outlet slopes upwards from behind and its edge is called the *costal margin*.⁽¹⁰⁶⁾ The vertebral bodies project forwards in the midline at the back of the thorax and thus narrow the anteroposterior diameter in this part. There is, however, a marked recess on either side of the vertebrae in front of the posterior ends of the ribs where they pass backwards in front of the transverse processes.

THE UPPER LIMB BONES. The upper appendicular skeleton consists of the *pectoral girdle*⁽¹⁰⁶⁾ and the upper limb bones. The pectoral girdle consists in front of the tubular *clavicle*⁽¹⁰⁷⁾ (collar bone) which lies transversely and the triangular *scapula*⁽¹⁰⁸⁾ which lies on the back part of the upper seven ribs. Projecting horizontally backwards is the *spine*⁽¹⁰⁹⁾ of the scapula which if followed laterally is seen to turn forwards to form a shelf known as the *acromion*.⁽¹¹⁰⁾ The clavicle articulates laterally with the medial border of the acromion and medially with the manubrium of the sternum and the first costal cartilage. The upper lateral angle of the scapula has a shallow saucer-like area called the *glenoid cavity*.⁽¹¹¹⁾ Medial to its upper part and projecting forwards below the acromion is the *coracoid process*.⁽¹¹²⁾

The *humerus*⁽¹¹³⁾ is the bone of the upper arm. It has a more or less rounded shaft and an upper end which has a hemispherical *head* facing medially for articulation with the glenoid cavity at the shoulder joint. The distal end of the humerus is flattened and has a lateral articular area (*capitulum*)⁽¹¹⁴⁾ which is rounded, and a medial articular area (*trochlea*)⁽¹¹⁵⁾ which is pulley-shaped. The lateral bone of the fore-