

主编 郑愿华 韩跃勤

新编

# 基础实用 医学英语

MODERN FUNDAMENTAL MEDICAL  
ENGLISH IN PRACTICE

DNA



科学出版社

Modern Fundamental Medical  
English in Practice

新编基础实用医学英语

主 编	郑愿华	韩跃勤	
主 审	王 涛		
副主编	韩翠霞	庞红梅	张 峰
编 者	(按汉语拼音排序)		
	毕秋玲	陈晓锐	初宏宇
	韩秀萍	刘 燕	夏伯乔
	杨 倩	袁 琳	

科 学 出 版 社

北 京

· 版权所有 侵权必究 ·

举报电话:010-64030229;010-64034315;13501151303(打假办)

## 内 容 简 介

本教程共分为16个单元;每个单元分为A、B两篇课文。课文A为系统基本知识与构成介绍,课文B为与此系统有关的病症介绍。每篇课文之后,都配有相应练习,便于学生复习巩固所学知识。本教程在以人体系统为主线的现代医学英语学习框架下,注重突出时代性、实用性、易读性和能动性。

本书适合医药院校本科生使用。

### 图书在版编目(CIP)数据

新编基础实用医学英语=Modern fundamental medical English in practice / 郑愿华,韩跃勤主编. —北京:科学出版社,2014.1

ISBN 978-7-03-039266-4

I. 新… II. ①郑… ②韩… III. 医学-英语 IV. H31

中国版本图书馆CIP数据核字(2013)第291402号

责任编辑:胡治国 / 责任校对:张小霞

责任印制:肖 兴 / 封面设计:范璧合

版权所有,违者必究。未经本社许可,数字图书馆不得使用

科学出版社 出版

北京东黄城根北街16号

邮政编码:100717

<http://www.sciencep.com>

安泰印刷厂 印刷

科学出版社发行 各地新华书店经销

\*

2013年12月第 一 版 开本:787×1092 1/16

2013年12月第一次印刷 印张:12 1/2

字数:298 000

定价:39.80元

(如有印装质量问题,我社负责调换)

# 前 言

近年来,大学英语教学改革和创新取得了很大的成绩。但是应用提高阶段的专业英语,尤其是医学专业英语的教学还较为薄弱。英语教学如何能与医学院校的专业培养有机地结合起来,如何在学生的英语语言学习与医学专业知识学习之间找到合适的切入点,一直是编者在医学院校从事大学英语教学工作中试图解决的问题。因此,编者的教学理念和编写本教程的宗旨为:

(1) 从医学专业分类的角度切入,基于主题阅读进行输出,将大学英语教学与医学专业知识有机地结合起来,使学生在了解专业知识的同时,熟悉和掌握语言的运用,交流和表达自己的专业思想;

(2) 从医学基本知识入手,使大学英语学习不再是构筑一个空洞的语言躯壳,而是拥有与专业学习相关的内涵;

(3) 难易适度,在大学英语教学中逐步渗入医学英语的内容,在提高语言技能的同时兼顾专业学科素养。

本教程共分为16个单元;每个单元分为A、B两篇课文。课文A为系统基本知识与构成介绍,课文B为与此系统有关的病症介绍。每篇课文之后,都配有相应练习,便于学生复习巩固所学知识。

本教程在以人体系统为主线的现代医学英语学习框架下,注重突出时代性、实用性、易读性和能动性。主要特点如下:

(1) 准确性:所有医学英语术语均采用全国科学技术名词审定委员会公布的名词(术语),具有权威性和约束力,是医学科研、教学、医疗以及与医疗有关的经营和新闻出版单位的使用标准。

(2) 时代性:所有材料都是对近十年以来出版和发表的医学文章、书籍或学术杂志的节选和改编。

(3) 实用性:按照人体系统进行分类,以医学知识带动英语的学习,以英语促进更多医学知识的获得,便于医学专业知识学习与英语语言学习互为补充促进,也方便读者的查阅和参考。

(4) 易读性:选取文章难易适度,将晦涩难懂之处做了相应的改编;课文配有大量的生词释义与插图,单词及专业术语均注有国际音标,便于理解与朗读。

(5) 能动性:pre-reading 和 post-reading 内容相互交织,便于师生在交流和互动中表达思想,使课堂活动的重点转移到主题的探索和交流上,使语言学习成为交流互动的“副产品”,语言成为思想内容的载体,有利于输出能力的培养。

(6) 详尽性:本书书后配有详尽的附录,对医学英语词汇的希腊语和拉丁语词根及前后缀进行了详细的列举;对书中出现的所有生词均按照字母进行排序;本书还列出了常见医用仪器设备、国内外医学杂志与网站,为读者的后续学习提供资源。

(7) 人文性:本书注重对医学生的人文素质教育与培养,特别列出了希波克拉底誓言与南丁格尔宣言的中英文对照资料,以强化医学生尊重生命、救死扶伤的职业道德。

尽管我们对本书进行了反复推敲和不厌其烦的修改,但纰漏和错误在所难免,敬请同行和读者不吝赐教。

在本书的编写和出版过程中,得到了滨州医学院留美医学博士马春蕾教授和胡雪梅教授的认真审阅;得到了滨州医学院领导与教务处领导们的大力支持;得到了同仁们的大力配合。在此一并致谢!

编 者

2013年7月



# THE OATH OF A MEDICAL STUDENT

Health related, life entrusted.

The moment I step into the hallowed medical institution,

I pledge solemnly

I will volunteer myself to medicine with love for my motherland and loyalty to the people.

I will scrupulously abide by the medical ethics, respect my teachers and discipline myself.

I will strive diligently for the perfection of technology and for all-round development of myself.

I am determined to strive diligently to eliminate man's suffering, enhance man's health conditions and uphold the chasteness and honor of medicine.

I will heal the wounded and rescue the dying, regardless of the hardships.

I will always be in earnest pursuit of better achievement.

I will work all my life for the development of the nation's medical enterprise as well as mankind's physical and mental health.

## 医学生誓言

健康所系、性命相托。

当我步入神圣医学学府的时刻，谨庄严宣誓：

我志愿献身医学，热爱祖国，忠于人民，恪守医德，尊师守纪，刻苦钻研，孜孜不倦，精益求精，全面发展。

我决心竭尽全力除人类之病痛，助健康之完美，维护医术的圣洁和荣誉。救死扶伤，不辞艰辛，执着追求，为祖国医药卫生事业的发展和人类身心健康奋斗终生！

# Contents

<b>Unit 1 Musculoskeletal System</b>	(1)
Text A Musculoskeletal System	(1)
Text B Osteoarthritis	(8)
<b>Unit 2 Cardiovascular System</b>	(14)
Text A Human Cardiovascular System	(15)
Text B Arterial Blood and Venous Blood	(23)
<b>Unit 3 Respiratory System</b>	(26)
Text A Respiratory System( I )	(26)
Text B Respiratory System( II )	(36)
<b>Unit 4 Digestive System</b>	(38)
Text A Digestive System	(38)
Text B Absorption and Transport of Nutrients	(43)
<b>Unit 5 Urinary System</b>	(47)
Text A Urinary System( I )	(48)
Text B Urinary System( II )	(53)
<b>Unit 6 Reproductive System</b>	(56)
Text A Reproductive System	(56)
Text B Common Pregnancy Complaints and Questions	(63)
<b>Unit 7 Nervous System</b>	(65)
Text A Nervous System	(65)
Text B Development of Nervous System	(73)
<b>Unit 8 Endocrine System</b>	(76)
Text A Endocrine System	(76)
Text B Growth Disorders	(81)
<b>Unit 9 The Immune System</b>	(85)
Text A The Immune System	(86)
Text B Organs of the Immune System	(93)
<b>Unit 10 Anesthesia</b>	(96)
Text A Anesthesia	(96)
Text B Anesthesia	(101)
<b>Unit 11 Genetics</b>	(105)
Text A Genetics	(106)
Text B Genetic Inheritance	(113)
<b>Unit 12 Preventive Medicine</b>	(118)
Text A Preventive Medicine	(118)
Text B Infectious Diseases	(124)
<b>Unit 13 Pharmacy</b>	(132)
Text A Pharmacy	(132)

Text B Pedanius Dioscorides .....	(139)
<b>Unit 14 Pathology and Pathophysiology</b> .....	(141)
Text A Pathology .....	(141)
Text B Pathophysiology .....	(145)
<b>Unit 15 Public Health</b> .....	(147)
Text A Public Health .....	(147)
Text B History of Public Health .....	(153)
<b>Unit 16 Radiology</b> .....	(157)
Text A Radiology .....	(157)
Text B Radiologist .....	(167)
<b>Appendix</b> .....	(169)
Glossary .....	(169)
Prefixes of Medical English .....	(183)
Suffixes of Medical English .....	(186)
Hospital Daily Necessities and Devices .....	(187)
Medical Journals .....	(190)
常用医学网站 (Medical Websites) .....	(191)
The Florence Nightingale Pledge .....	(192)
南丁格尔誓言 .....	(192)
The Hippocratic Oath .....	(193)
希波克拉底誓言 .....	(193)
<b>References</b> .....	(194)



# Unit 1 Musculoskeletal System

## Pre-reading Activities

I. Read the following Paragraph and talk about with your partner what kind of disease it may refer to.

"First, the bone density decreases enough for bones to collapse or fracture, causing severe sudden pain or gradually developing aching bone pain and deformities. In long bones, such as the bones of the arms and legs, the fracture usually occurs at the ends of the bones rather than in the middle. The bones of the spinal column(vertebrae) are particularly at risk of fracture due to this disease. The fracture usually occurs in the middle to lower back. "

II. Try to understand the following terms before you read the text.

musculoskeletal [ˌmʌskjʊləʊ'sketəl] *adj.* relating to muscles and skeleton 肌(与)骨骼的  
ligament ['ligəmə(ə)nt] *n.* A ligament is a band of strong tissue in a person's body which connects bones. 韧带;纽带,系带

tendon ['tendən] *n.* a cord or band of inelastic tissue connecting a muscle with its bony attachment 筋,腱

bursa ['bə:sə] *n.* (*pl.* bursae, bursas) a small fluid-filled sac located between movable parts of the body especially at joints 囊,黏液囊

## Text A Musculoskeletal System

### Focus

Introduction

Skeletal System

Muscular System

Joints, Ligaments, and Bursae

Diseases and Disorders

### Introduction

The human musculoskeletal system (also known as the locomotor system) is an organ system that gives humans (and many animal species) the ability to move using the muscular and skeletal systems. The musculoskeletal system provides form, support, stability, and movement to the body.

It is made up of the body's bones (the skeleton), muscles, cartilages, tendons, ligaments, joints and other connective tissues that support and bind tissues and organs together. The musculoskeletal system's primary functions include supporting the body, allowing motion, and pro-



protecting vital organs. The skeletal portion of the system serves as the main storage system for calcium and phosphorus and contains critical components of the hematopoietic system.

This system describes how bones are connected to other bones and muscle fibers via connective tissues such as tendons and ligaments. The bones provide the stability to a body in analogy to iron rods in concrete construction. Muscles keep bones in place and also play a role in movement of the bones. To allow motion, different bones are connected by joints. Cartilage prevents the bone ends from rubbing directly on to each other. Muscles contract (bunch up) to move the bone attached at the joint (Fig. 1-1).

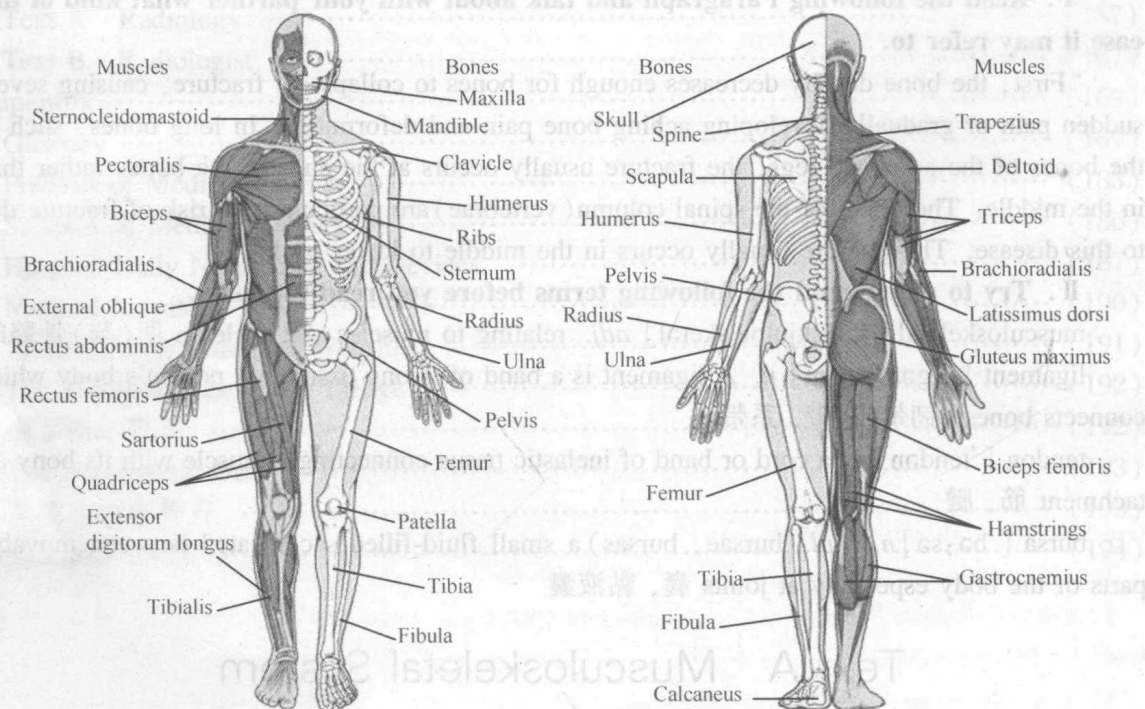


Fig. 1-1 Human musculoskeletal system

There are, however, diseases and disorders that may adversely affect the function and overall effectiveness of the system. These diseases can be difficult to diagnose due to the close relation of the musculoskeletal system to other internal systems. The musculoskeletal system refers to the system having its muscles attached to an internal skeletal system and is necessary for humans to move to a more favorable position. Complex issues and injuries involving the musculoskeletal system are usually handled by a physiatrist (specialist in Physical Medicine and Rehabilitation) or an orthopaedic surgeon.

## Skeletal System ( Fig. 1-2)

The skeletal system serves as a framework for the body. This framework consists of many individual bones and cartilages. There also are bands of fibrous connective tissues—the ligaments and the tendons—in intimate relationship with the parts of the skeleton. The number of bones in the human skeletal system is a controversial topic. Humans are born with over 300 bones; however, many bones fuse together between birth and maturity. As a result an average adult skeleton consists of 206 bones. The number of bones varies according to the method used to derive the count. While some

consider certain structures to be a single bone with multiple parts, others may see it as a single part with multiple bones. There are five general classifications of bones. These are long bones, short bones, flat bones, irregular bones, and **sesamoid** bones. The human skeleton is composed of both fused and individual bones supported by ligaments, tendons, muscles and **cartilages**.

The human skeleton, like that of other **vertebrates**, consists of two principal subdivisions, each with origins distinct from the others and each presenting certain individual features. These are the axial, comprising the vertebral column—the spine—and much of the skull, and the **appendicular**, to which the pelvic (hip) and pectoral (shoulder) girdles and the bones and cartilages of the limbs belong.

When one considers the relation of these subdivisions of the skeleton to the soft parts of the human body—such as the nervous system, the digestive system, the respiratory system, the **cardiovascular** system, and the voluntary muscles of the muscle system—it is clear that the functions of the skeleton are of three different types: support, protection, and motion. Of these functions, support is the most primitive and the oldest; likewise, the axial part of the skeleton was the first to evolve. The vertebral column, corresponding to the notochord in lower organisms, is the main support of the trunk.

The central nervous system lies largely within the axial skeleton. The brain is well protected by the cranium and the spinal cord by the vertebral column, by means of the bony neural arches (the arches of bone that encircle the spinal cord) and the intervening ligaments.

A distinctive characteristic of humans as compared with other mammals is erect posture. The human body is to some extent like a walking tower that moves on pillars, represented by the legs. Tremendous advantages have been gained from this erect posture, the chief among which has been the freeing of the arms for a great variety of uses. Nevertheless, erect posture has created a number of mechanical problems—in particular, weight bearing. These problems have had to be met by adaptations of the skeletal system.

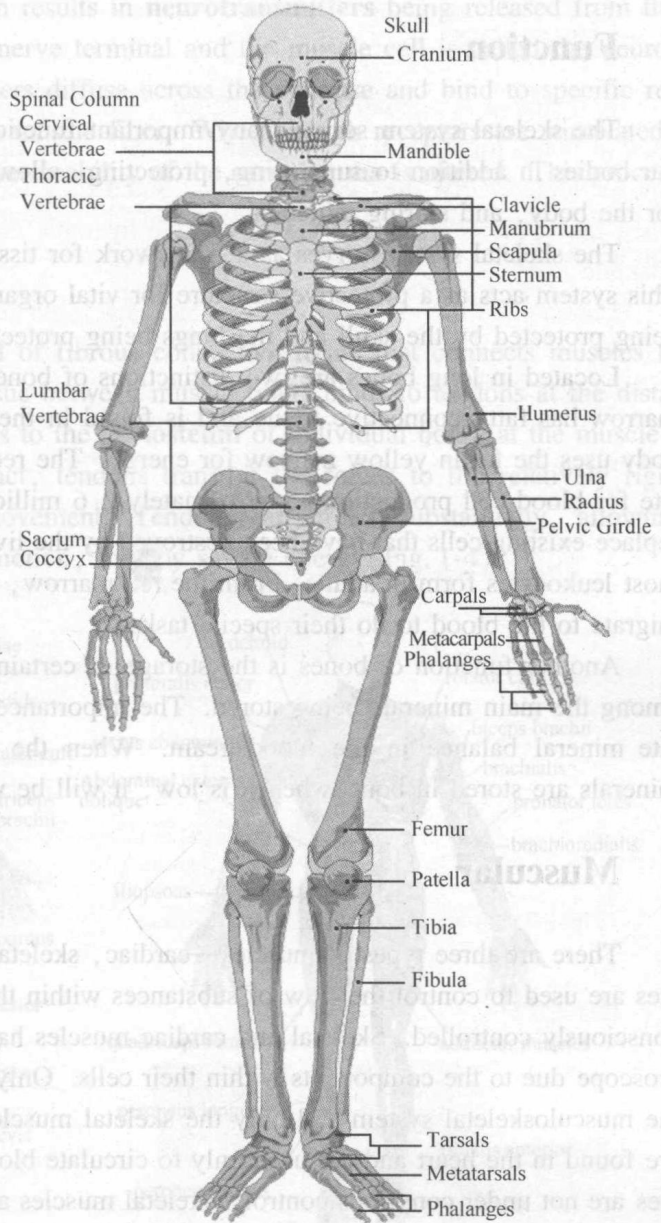


Fig. 1-2 Front view of a skeleton of an adult human

## Function

The skeletal system serves many important functions. It provides the shape and form for our bodies in addition to supporting, protecting, allowing bodily movement, producing blood for the body, and storing minerals.

The skeletal system serves as a framework for tissues and organs to attach themselves to. This system acts as a protective structure for vital organs. Major examples of this are the brain being protected by the skull and the lungs being protected by the rib cage.

Located in long bones are two distinctions of bone marrow (yellow and red). The yellow marrow has fatty connective tissue and is found in the marrow cavity. During starvation, the body uses the fat in yellow marrow for energy. The red marrow of some bones is an important site for blood cell production, approximately 2.6 million red blood cells per second in order to replace existing cells that have been destroyed by the liver. Here all erythrocytes, platelets, and most leukocytes form in adults. From the red marrow, **erythrocytes**, **platelets**, and **leukocytes** migrate to the blood to do their special tasks.

Another function of bones is the storage of certain minerals. Calcium and phosphorus are among the main minerals being stored. The importance of this storage “device” helps to regulate mineral balance in the bloodstream. When the fluctuation of minerals is high, these minerals are stored in bone; when it is low, it will be withdrawn from the bone.

## Muscular

There are three types of muscles—cardiac, skeletal, and smooth (Fig. 1-3). Smooth muscles are used to control the flow of substances within the lumens of hollow organs, and are not consciously controlled. Skeletal and cardiac muscles have striations that are visible under a microscope due to the components within their cells. Only skeletal and smooth muscles are part of the musculoskeletal system and only the skeletal muscles can move the body. Cardiac muscles are found in the heart and are used only to circulate blood; like the smooth muscles, these muscles are not under conscious control. Skeletal muscles are attached to bones and arranged in opposing groups around joints. Muscles are innervated, to communicate nervous energy to, by nerves, which conduct electrical currents from the central nervous system and cause the muscles to contract.

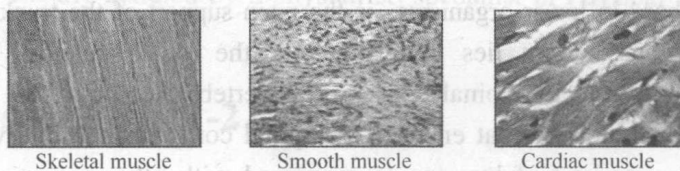


Fig. 1-3 Types of muscle and their appearance

## Contraction Initiation

In mammals, when a muscle contracts, a series of reactions occur. Muscle contraction is stimulated by the motor neuron sending a message to the muscles from the somatic nervous sys-



tem. Depolarization of the motor neuron results in **neurotransmitters** being released from the nerve terminal. The space between the nerve terminal and the muscle cell is called the neuromuscular junction. These neurotransmitters diffuse across the **synapse** and bind to specific receptor sites on the cell membrane of the muscle fiber. When enough receptors are stimulated, an action potential is generated and the permeability of the **sarcolemma** is altered. This process is known as initiation.

## Tendons

A tendon is a tough, flexible band of fibrous connective tissue that connects muscles to bones. The extra-cellular connective tissue between muscle fibers binds to tendons at the distal and proximal ends, and the tendon binds to the **periosteum** of individual bones at the muscle's origin and insertion. As muscles contract, tendons transmit the forces to the relatively rigid bones, pulling on them and causing movement. Tendons can stretch substantially, allowing them to function as springs during locomotion, thereby saving energy (Fig. 1-4).

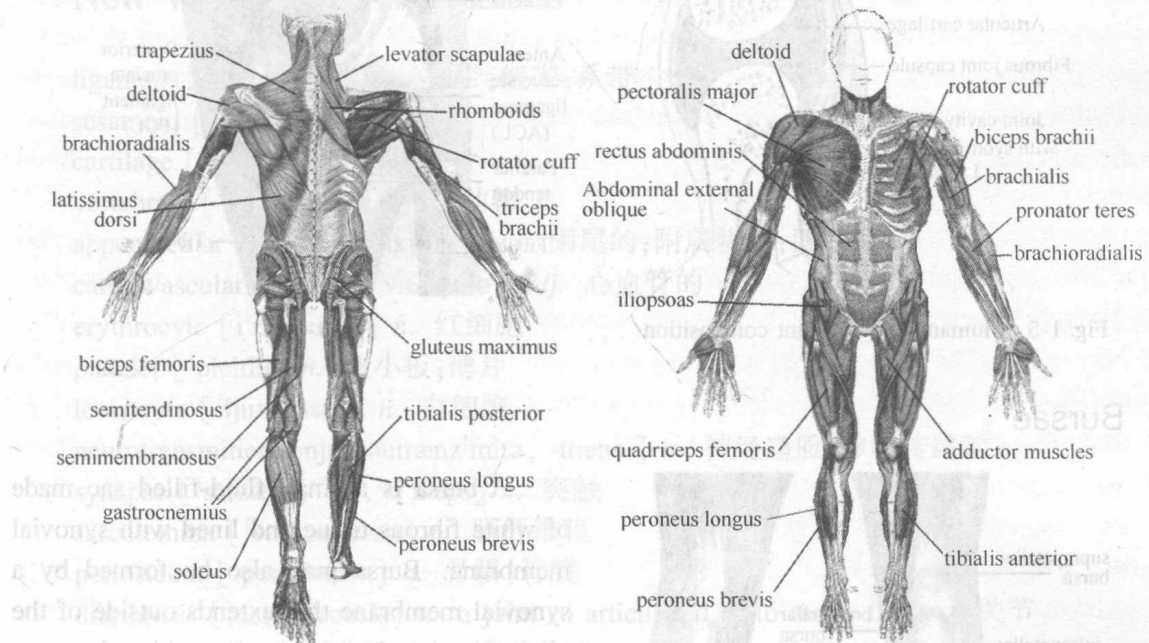


Fig. 1-4 Anterior and posterior view of muscles of an adult human

## Joints, Ligaments, and Bursae

### Joints

Joints are structures that connect individual bones and may allow bones to move against each other to cause movement. There are two divisions of joints, **diarthroses** which allow extensive mobility between two or more articular heads, and false joints or **synarthroses**, joints that are immovable, that allow little or no movement and are predominantly fibrous. **Synovial** joints, joints that are not directly joined, are lubricated by a solution called synovial fluid that is produced by the synovial membranes. This fluid lowers the friction between the articular surfaces and is kept within an articular capsule, binding the joint with its taut tissue (Fig. 1-5).



## Ligaments

A ligament is a small band of dense, white, fibrous elastic tissue. Ligaments connect the ends of bones together in order to form a joint. Most ligaments limit dislocation, or prevent certain movements that may cause breaks. Since they are only elastic they increasingly lengthen when under pressure. When this occurs the ligament may be susceptible to break resulting in an unstable joint.

Ligaments may also restrict some actions; movements such as hyper extension and hyper flexion are restricted by ligaments to an extent. Also ligaments prevent certain directional movement( Fig. 1-6).

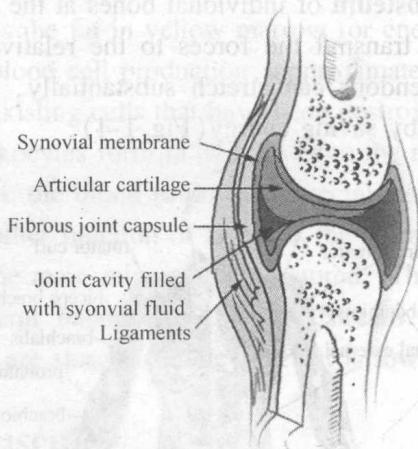


Fig. 1-5 Human synovial joint composition

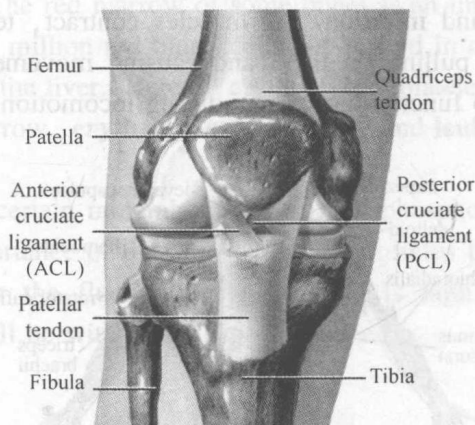


Fig. 1-6

## Bursae

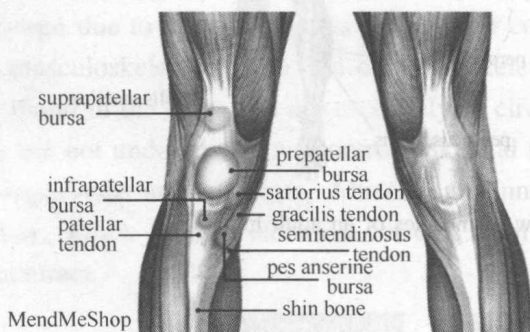


Fig. 1-7

A bursa is a small fluid-filled sac made of white fibrous tissue and lined with synovial membrane. Bursa may also be formed by a synovial membrane that extends outside of the joint capsule. It provides a cushion between bones and tendons and/or muscles around a joint; bursas are filled with synovial fluid and are found around almost every major joint of the body( Fig. 1-7).

## Diseases and Disorders

Because many other body systems, including the vascular, nervous, and **integumentary** systems, are interrelated, disorders of one of these systems may also affect the musculoskeletal system and complicate the diagnosis of the disorder's origin. Diseases of the musculoskeletal system mostly encompass functional disorders or motion discrepancies; the level of impairment depends specifically on the problem and its severity. Articular( of or pertaining to the joints)

disorders are the most common among the diagnoses, for example, primary muscular diseases, neurologic (related to the medical science that deals with the nervous system and disorders affecting it) deficits, toxins, endocrine abnormalities, metabolic disorders, infectious diseases, blood and vascular disorders, and nutritional imbalances. Disorders of muscles from another body system can bring about irregularities such as impairment of ocular motion and control, respiratory dysfunction, and bladder malfunction. Complete paralysis, paresis, or ataxia may be caused by primary muscular dysfunctions of infectious or toxic origin; however, the primary disorder is usually related to the nervous system, with the muscular system acting as the effector organ, an organ capable of responding to a stimulus, especially a nerve impulse. One understated disorder that begins during pregnancy is Pelvic girdle pain, it is complex and multi-factorial and likely to be also represented by a series of sub-groups driven by pain varying from peripheral or central nervous system, altered laxity/stiffness of muscles, laxity to injury of tendinous/ligamentous structures to “mal-adaptive” body mechanics.

## New Words and Expressions

ligament [ˈlɪɡəmənt] *n.* 韧带; 纽带; 系带

sesamoid [ˈsesəmoɪd] *n.* 籽骨

cartilage [ˈkɑːt(i)lɪdʒ] *n.* 软骨

vertebrate [ˈvɜːtɪbrət] *n.* 脊椎动物

appendicular [ˌæp(ə)nˈdɪkjələ] *adj.* 阑尾的; 附属物的; 四肢的

cardiovascular [ˌkɑːdɪəʊˈvæskjələ] *adj.* 心血管的

erythrocyte [ˈɪrɪθrəʊsaɪt] *n.* 红细胞

platelet [ˈpleɪtlɪt] *n.* 血小板; 薄片

leukocyte [ˈljuːkəʊsaɪt] *n.* 白细胞

neurotransmitter [ˌnjuərəʊtrænzˈmɪtə, -træns-] *n.* 神经递质; 神经传递素

synapse [ˈsainæps, ˈsi-, ˈsɪnæps] *n.* 突触

sarcolemma [ˈsɑːkəʊlemə] *n.* 肌纤维膜

periosteum [ˌperiˈfʃtiəm] *n.* 骨膜; 管膜

diarthrosis [ˌdaɪɑːˈθrəʊsɪs] *n.* a joint so articulated as to move freely 动关节

synarthrosis [ˌsɪnɑːˈθrəʊsɪs] *n.* 不动关节

synovial [ˌsɪnəʊviəl, ˌsai-] *adj.* 关节滑液的; 与关节滑液有关的; (关节)有滑膜的

integumentary system [ɪnˈteɡjuːmentəriˈsɪstəm] 皮肤系统

## Post-reading Activities

### I. Answer the following questions according to Text A.

1. What are the musculoskeletal system's primary functions?
2. What is the relation between bones and muscle fibers?
3. What are the two principal subdivisions of human skeleton? Please describe them.
4. What are the differences between red bone marrow and yellow bone marrow?
5. What are three types of muscles? Please describe them.
6. What are two divisions of joints?

## II. Terms Explanation.

1. joints
2. ligaments
3. bursae
4. synovial fluid

## III. Translate the following terms into English.

1. 韧带	2. 籽骨	3. 软骨
4. 舌骨	5. 红细胞	6. 血小板
7. 白细胞	8. 神经递质	9. 突触
10. 骨膜	11. 附着处	12. 动关节

## IV. Translate the following paragraph into Chinese.

Disorders of muscles from another body system can bring about irregularities such as impairment of ocular motion and control, respiratory dysfunction, and bladder malfunction. Complete paralysis, paresis, or ataxia may be caused by primary muscular dysfunctions of infectious or toxic origin; however, the primary disorder is usually related to the nervous system, with the muscular system acting as the effector organ, an organ capable of responding to a stimulus, especially a nerve impulse.

# Text B Osteoarthritis

## Joint Disorders

Osteoarthritis (OA)

Rheumatoid Arthritis (RA)

Spondyloarthritis

Psoriatic Arthritis

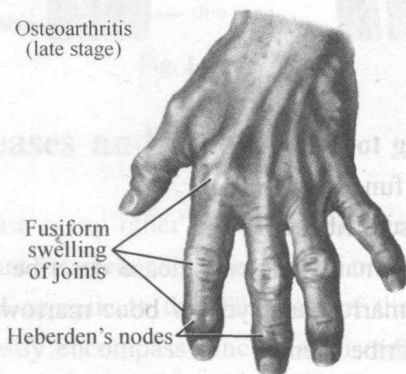
Reactive Arthritis

Ankylosing Spondylitis

Neurogenic Arthropathy (Charcot Joints)

Osteoarthritis (OA) (Fig. 1-8) (Degenerative Arthritis; Degenerative Joint Disease; Osteoarthritis; Hypertrophic Osteoarthritis)

Osteoarthritis  
(late stage)



Osteoarthritis



Healthy joint



Fig. 1-8 Hand Osteoarthritis



Osteoarthritis is a chronic disorder associated with damage to the cartilage and surrounding tissues and characterized by pain, stiffness, and loss of function.

- Arthritis due to damage of joint cartilage and surrounding tissues becomes very common with aging.
- Pain, swelling, and bony overgrowth are common, as well as stiffness that follows awakening or inactivity and disappears within 30 minutes, particularly if the joint is moved.
- The diagnosis is based on symptoms and X-rays.
- Treatment includes exercises and other physical measures, drugs that reduce pain and improve function, and, for very severe changes, joint replacement or other surgery.

Osteoarthritis, the most common joint disorder, often begins in the 40s and 50s and affects almost all people to some degree by age 80. Before the age of 40, men develop osteoarthritis more often than women do, often because of injury. Many people have some evidence of osteoarthritis on X-rays (often by age 40), but only half of these people have symptoms. From age 40 to 70, women develop the disorder more often than men do. After age 70, the disorder develops in both sexes equally.

Osteoarthritis is classified as primary (or idiopathic) when the cause is not known (as in the large majority of cases). Primary osteoarthritis may affect only certain joints, such as the knee, or all joints.

Osteoarthritis is classified as secondary when the cause is another disease or condition, such as an infection, joint abnormality that appeared at birth, injury, metabolic disorder (for example, excess iron in the body [hemochromatosis] or excess copper in the liver [Wilson disease]), or a disorder that damages joint cartilage (for example, rheumatoid arthritis or gout). Some people who repetitively stress one joint or a group of joints, such as foundry workers, farmers, coal miners, and bus drivers, are particularly at risk. The major risk factor for osteoarthritis of the knee comes from having an occupation that involves bending of the joint. Curiously, long-distance running does not increase the risk of developing the disorder. However, once osteoarthritis develops, this type of exercise often makes the disorder worse. Obesity may be a major factor in the development of osteoarthritis, particularly of the knee and especially in women.

## Causes

Normally, joints have such a low friction level that they are protected from wearing out, even after years of typical use, overuse, or injury. Osteoarthritis is caused most often by tissue damage. In an attempt to repair a damaged joint, chemicals accumulate in the joint and increase the production of the components of cartilage, such as collagen (a tough, fibrous protein in connective tissue) and **proteoglycans** (substances that provide resilience). Next, the cartilage may swell because of water retention, become soft, and then develop cracks on the surface. Tiny cavities form in the bone beneath the cartilage, weakening the bone. The attempt of the tissues to repair the damage may lead to new growth of cartilage, bone, and other tissue. Bone can overgrow at the edges of the joint, causing bumps (osteophytes) that can be seen and felt. Ultimately, the smooth, slippery surface of the cartilage becomes rough and pitted, so that the joint can no longer move smoothly and absorb impact. All the components of the joint—bone, joint



capsule(tissues that enclose most joints), synovial tissue(tissue lining the joint cavity), tendons, ligaments, and cartilage—fail in various ways, thus altering the function of the joint.

## Symptoms

Usually, symptoms develop gradually and affect only one or a few joints at first. Joints of the fingers, base of the thumbs, neck, lower back, big toes, hips, and knees are commonly affected. Pain, often described as a deep ache, is the first symptom and, when in the weight-bearing joints, is usually made worse by activities that involve weight bearing(such as standing). In some people, the joint may be stiff after sleep or some other inactivity, but the stiffness usually subsides within 30 minutes, particularly if the joint is moved.

As the condition causes more symptoms, the joint may become less movable and eventually may not be able to fully straighten or bend. New growth of cartilage, bone, and other tissue can enlarge the joints. The irregular cartilage surfaces cause joints to grind, grate, or crackle when they are moved and tenderness develops. Bony growths commonly develop in the joints closest to the fingertips(called Heberden nodes)or middle of the fingers(called Bouchard nodes).

## Diagnosis

The doctor makes the diagnosis based on the characteristic symptoms, physical examination, and the X-ray appearance of joints(such as bone enlargement and narrowing of the joint space). However, X-rays are not very useful for detecting osteoarthritis early because they do not show changes in cartilage, which is where the earliest abnormalities occur. Also, changes on the X-ray often correlate poorly with symptoms. For example, an X-ray may show only a minor change in a person who has severe symptoms, or an X-ray may show numerous changes in a person who has very few, if any, symptoms. Thus, X-rays are not always used or needed to make the diagnosis.

Magnetic resonance imaging(MRI) can reveal early changes in cartilage, but it is rarely needed for the diagnosis. There are no blood tests for the diagnosis of osteoarthritis, although blood tests may help rule out other disorders(such as Rheumatoid Arthritis(RA)). If a joint is swollen, doctors may numb the area with an injected anesthetic and then insert a needle into the joint to draw a sample of the joint fluid. The fluid is examined to differentiate osteoarthritis from other joint disorders such as infection and gout.

## Treatment

The main goals of treatment are to relieve pain, maintain joint flexibility, and optimize joint and overall function. These goals are primarily achieved by physical measures that involve exercises for strength, flexibility, endurance and rehabilitation(physical therapy). People are taught how modifying their daily activities can help them live with osteoarthritis. Additional treatment includes drugs, surgery(for some people), and newer therapies.