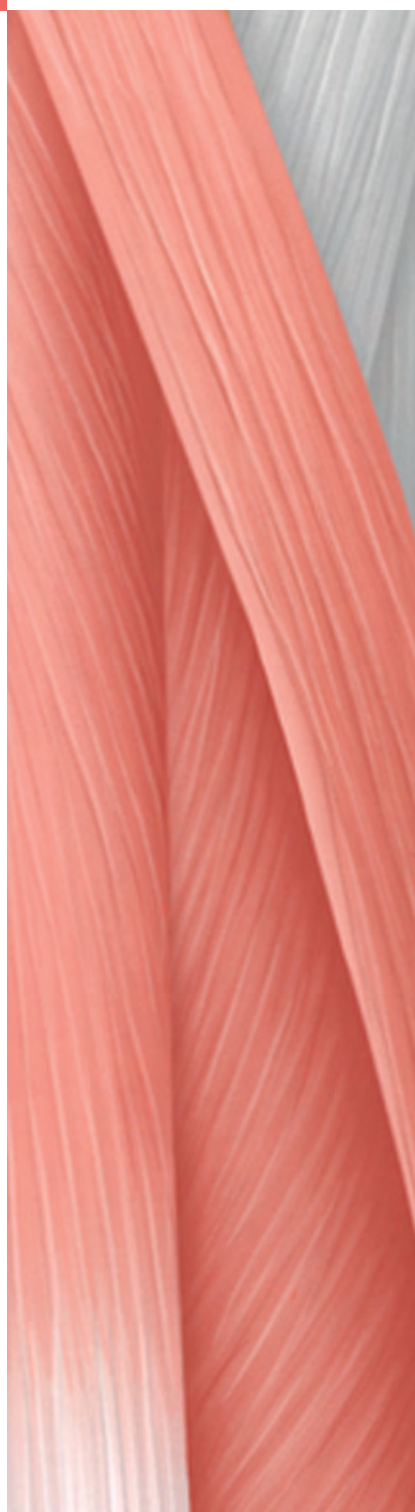
Musculoskeletal System

14



Chapter Outline

Objectives

After completion of this chapter you will be able to:

1. Describe the location of key bones and muscles in the body.
2. Define terms related to bone structure, joints, joint movements, and muscles.
3. Define combining forms, prefixes, and suffixes related to the musculoskeletal system.
4. Define common medical terminology related to the musculoskeletal system, including adjectives and related terms, symptoms and conditions, tests and procedures, surgical interventions and therapeutic procedures, medications and drug therapies, and specialties.
5. Explain abbreviations for terms related to the musculoskeletal system.
6. Successfully complete all chapter exercises.
7. Explain terms used in medical records and case studies involving the musculoskeletal system.
8. Successfully complete all pronunciation and spelling exercises, and complete all interactive exercises included with the companion Student Resources.

ANATOMY AND PHYSIOLOGY

Functions

- To give shape and structure to the body and provide support
- To allow movement
- To protect internal organs
- To store calcium and other minerals (bones)
- To produce certain blood cells (bone marrow)
- To produce heat (muscles)

Structures

- The body has 206 bones, divided into the axial skeleton and appendicular skeleton.
- The body has more than 600 muscles.
- Bones articulate (meet) at joints where muscles allow for different types of joint movements.

Terms Related to Bone Structure (Fig. 14-1)

Term	Pronunciation	Meaning
bone marrow	bōn ma'rō	soft tissue within bone, with multiple functions including production of blood cells
cancellous bone, *syn.* spongy bone	kan'sĕ-lŭs bōn; spŏn'jē bōn	meshlike bone tissue (Fig. 14-2)
compact bone	kŏm-pakt' bōn	harder, denser bone (Fig. 14-2)
diaphysis	dī-af'i-sis	the shaft of a long bone
endosteum	en-dos'tē-ŭm	membrane within medullary cavity
epiphysis	e-pif'i-sis	the wider ends of a long bone
epiphysial plate	ep'i-fiz'ē-ăl plāt	the growth area of a long bone
medullary cavity	med'ŭ-lar'ē kav'i-tē	space within long bone shaft filled with bone marrow
metaphysis	mĕ-taf'i-sis	the flared section of a long bone between the diaphysis and epiphysis
os, *pl.* ossa	os, os'ă	bone
osteoblast	os'tē-ō-blast	bone-forming cell
osteoclast	os'tē-ō-klast	a cell that helps remove osseous (bony) tissue
osteocyte	os'tē-ō-sīt	bone cell
periosteum	per'ē-os'tē-ŭm	membrane surrounding a bone

Terms Related to the Skeleton and Bones (Fig. 14-3)

Term	Pronunciation	Meaning
The Skeleton		
axial skeleton	ak'sē-ăl skel'ĕ-tŏn	bones of the skull, spine, and chest
appendicular skeleton	ap'ĕn-dik'yŭ-lăr skel'ĕ-tŏn	bones of the upper and lower limbs, shoulder, and pelvis
thorax	thō'raks	the chest

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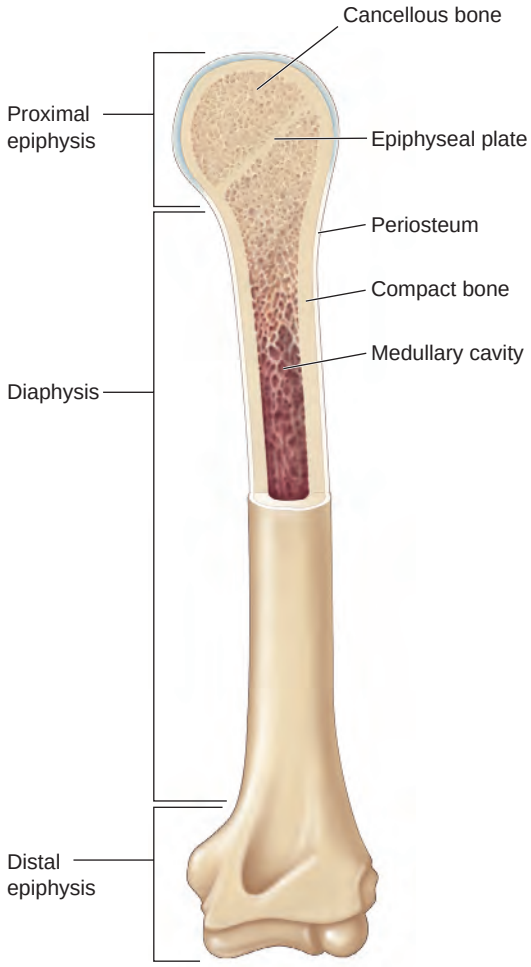

Figure 14-1 The external and internal composition of a long bone.

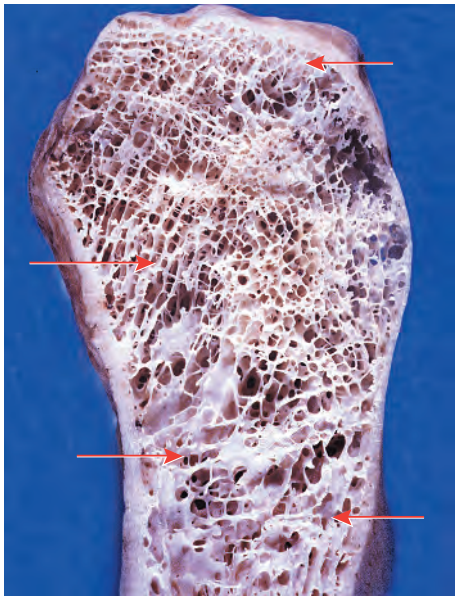

Figure 14-2 Types of bone tissue. Cancellous bone makes up most of the epiphysis of this long bone (*arrows*). A thin layer of compact bone is seen at the surface.

Terms Related to the Skeleton and Bones *(continued)*

Term	Pronunciation	Meaning
Bones		
acetabulum	as-ĕ-tab′yū-lŭm	the socket of the pelvic bone where the femur articulates
acromion	ă-krō′mē-on	lateral upper section of the scapula
calcaneus	kal-kā′nē-ŭs	bone of the heel
carpal bones	kahr′păl bōnz	the eight bones of the wrist
clavicle	klav′i-kĕl	collarbone
cranium	krā′nē-ŭm	the skull; composed of eight bones
femur	fē′mŭr	bone of the upper leg
fibula	fib′yū-lă	smaller, outer bone of the lower leg
humerus	hyū′mĕr-ŭs	bone of the upper arm
hyoid	hī′oyd	bone beneath the mandible
lamina	lam′i-nă	posterior section of a vertebra
mandible	man′di-bĕl	lower bone of the jaw

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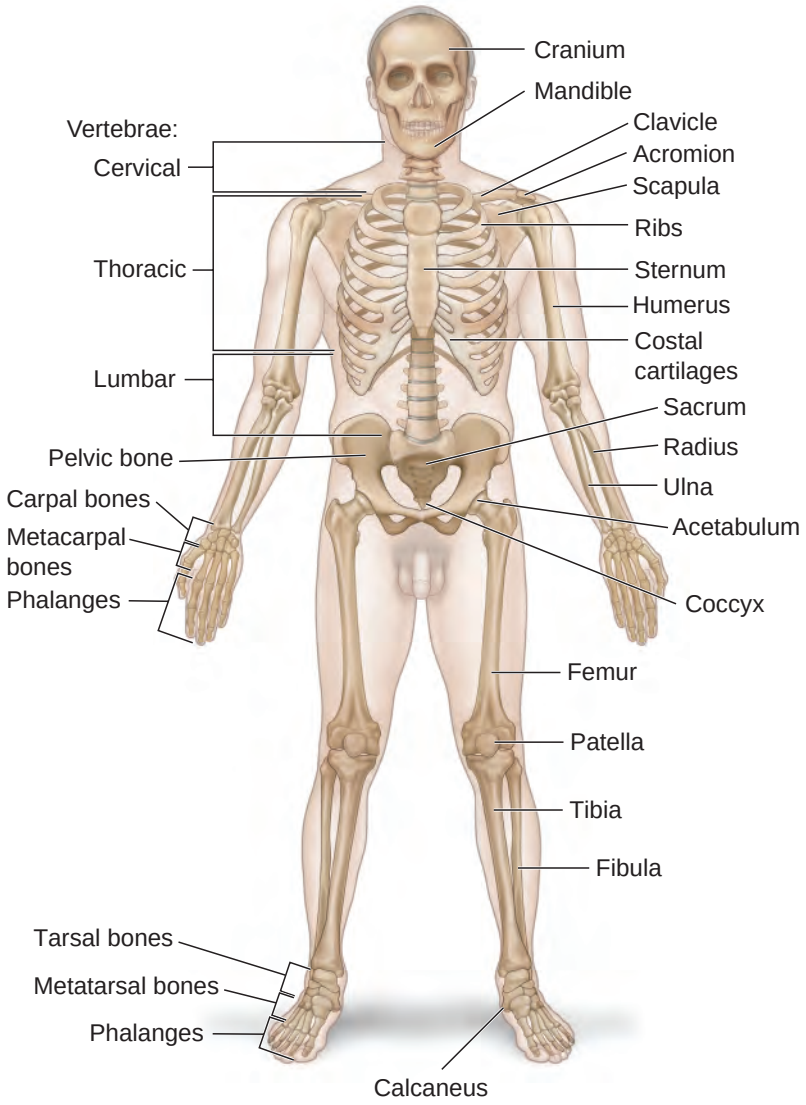

Figure 14-3 An anterior view of the skeleton with major bones identified.

Terms Related to the Skeleton and Bones *(continued)*

Term	Pronunciation	Meaning
maxilla	mak-sil'ă	upper bone of the jaw
metacarpal bones	met'ă-kahr'păl bōnz	the five bones of the palm of the hand
metatarsal bones	met'ă-tahr'săl bōnz	the five bones of the foot
patella	pă-tel'ă	kneecap
pelvic bone	pel'vik bōn	the hip bone, composed of three fused bones on each side
ischium	is'kē-ŭm	posterior lower section of the pelvic bone
ilium	il'ē-ŭm	upper section of the pelvic bone
pubis	pyū'bis	anterior lower section of pelvic bone; pubic bone
phalanges	fă-lan'-jēz	the bones of the fingers and toes; 14 in each hand or foot

(continued)

Terms Related to the Skeleton and Bones *(continued)*

Term	Pronunciation	Meaning
radius	rā′dē-ŭs	the outer of two bones of the lower arm
ribs	ribz	long curved bones that form the bony wall of the chest
scapula	skap′yū-lă	shoulder blade
sternum	stĕr′nŭm	anterior bone of thorax; breast bone
tarsal bones	tahr′săl bōnz	the seven bones of the ankle
tibia	tib′ē-ă	larger inner bone of the lower leg
ulna	ŭl′nă	the more inner of two bones of the lower arm
vertebra	vĕr′tĕ-bră	a bone of the spine (Fig. 14-4)
cervical vertebrae (C1–C7)	sĕr′vi-kăl vĕr′tĕ-brā	bones of neck
thoracic vertebrae (T1–T12)	thōr-as′ik vĕr′tĕ-brā	bones of midspine
lumbar vertebrae (L1–L5)	lŭm′bahr vĕr′tĕ-brā	bones of lower back
sacrum	sā′krŭm	five fused vertebrae below the lumbar spine
coccyx	kok′siks	four fused vertebrae at the lower end of the spine, below the sacrum; the tailbone
xiphoid process	zī′foyd pros′es	lower section of the sternum

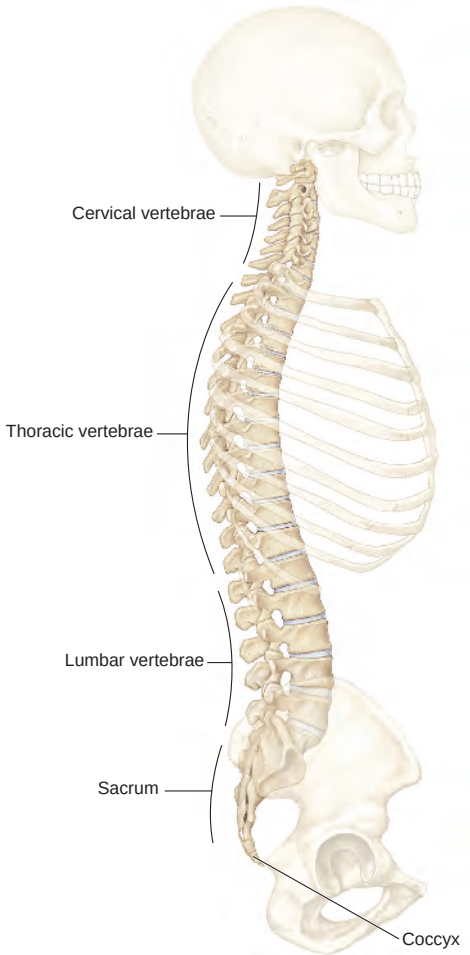

Figure 14-4 The vertebral column showing the types of vertebrae.

View the *Vertebral Disk* video on the electronic Student Resources to learn more about the structure of the bones of the spine.

Joints and Joint Movements

- Joints occur wherever bones come together.
- Joints are categorized by the movements they perform.
- Terms for joint movements are based on the type and direction of movement.

Terms Related to Joints and Joint Movements

Term	Pronunciation	Meaning
	Joints	
articulation	ahr-tik′yū-lā′shŭn	the site where bones come together
bursa	bŭr′să	a fluid-filled fibrous sac within some joints
cartilage	kahr′ti-lăj	dense connective tissue attached to bone in many joints
synovial joint, *syn.* diarthrosis	si-nō′vē-ăl joynt, dī′ahr-thrō′sis	a joint that moves freely; the joint cavity contains synovial fluid (Fig. 14-5)
intervertebral disk (or disc)	in′tĕr-vĕr′tĕ-brăl disk	platelike structure of connective tissue between vertebrae
ligament	lig′ă-mĕnt	band of strong connective tissue joining bones

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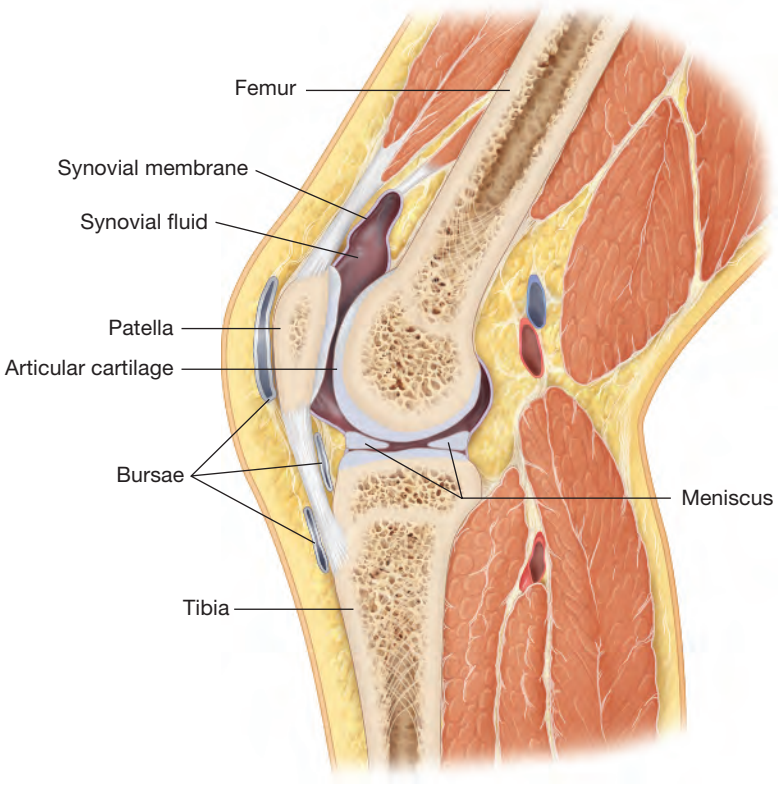

Figure 14-5 The knee is a synovial joint.

Terms Related to Joints and Joint Movements *(continued)*

Term	Pronunciation	Meaning
meniscus	mĕ-nis′kŭs	cartilage structure in the knee
suture	sū′chŭr	an immovable joint, such as that which joins the bones of the skull

SUTURE When we think of joints, we think of those joints that move. Your skull also has joints, but the joints of the skull do not move. These joints, called *sutures*, hold the bones of the skull together, just as surgical sutures (or "stitches") hold two surfaces together.

symphysis	sim′fi-sis	a joint that moves only slightly
synovial fluid	si-nō′vē-ăl flū′id	lubricating fluid in a freely moving joint
tendon	ten′dŏn	band of fibrous connective tissue attaching a muscle to a bone
Joint Movements (Fig. 14-6)		
abduction	ab-dŭk′shŭn	moving away from the midline
adduction	ă-dŭk′shŭn	moving toward the midline
circumduction	sĭr′kŭm-dŭk′shŭn	moving in a circular manner
inversion	in-vĕr′zhŭn	turning inward
eversion	ē-vĕr′zhŭn	turning outward
dorsiflexion	dōr-si-flek′shŭn	bending foot upward
plantar flexion	plan′tahr flek′shŭn	bending foot downward
extension	eks-ten′shŭn	motion that increases the joint angle
flexion	flek′shŭn	motion that decreases the joint angle
pronation	prō-nā′shŭn	turning downward (palm of hand or sole of foot)
supination	sū′pi-nā′shŭn	turning upward (palm of hand or sole of foot)
rotation	rō-tā′shŭn	moving in circular direction around an axis

Adduction, abduction: When distinguishing abduction from adduction, remember the common word abduct, meaning to take *away*. Adduction has the word "add," meaning to bring *to*.

ANIMATION

View the animation entitled *Muscle Extension and Flexion* for a demonstration of muscles at work.

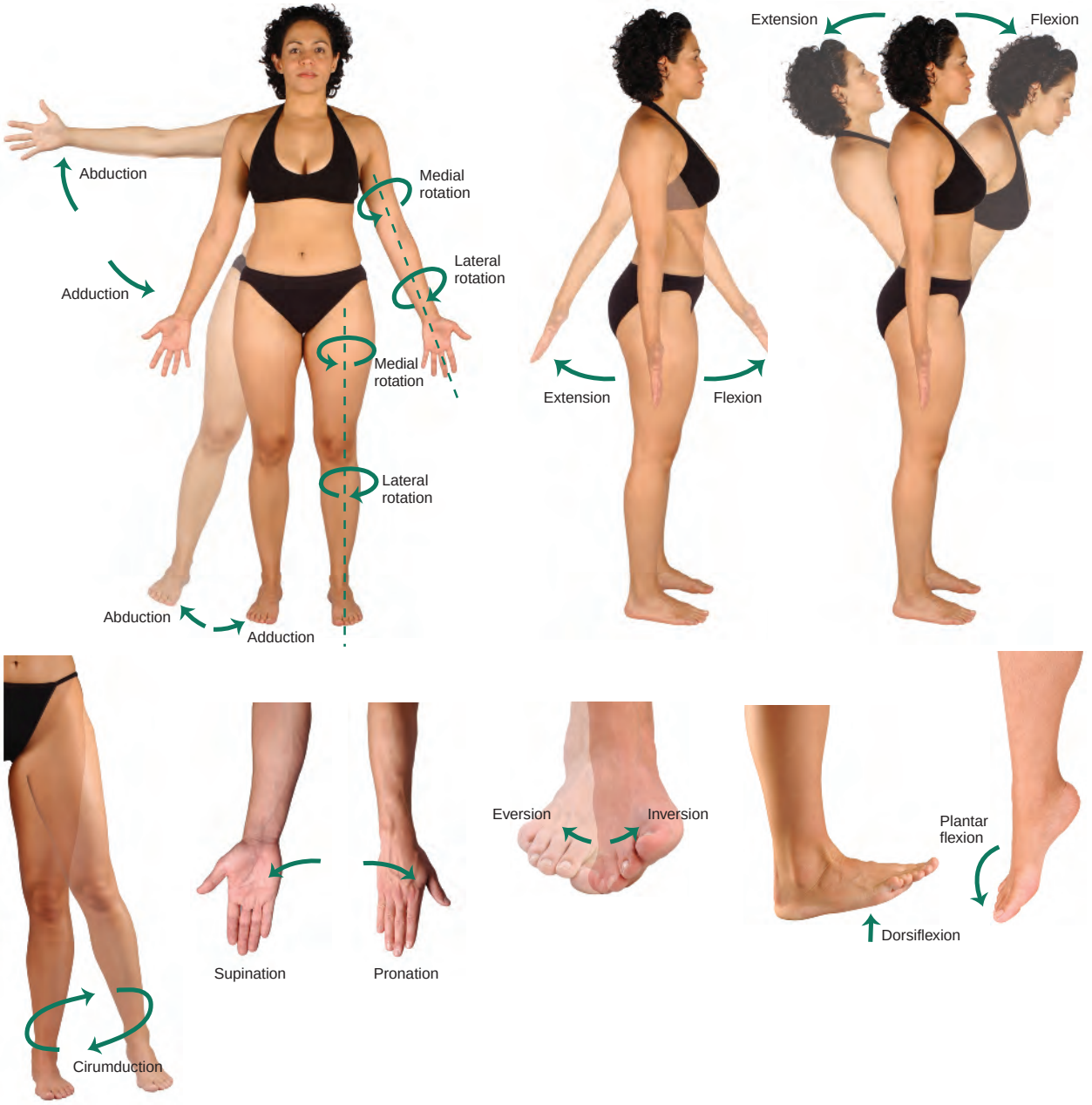

Figure 14-6 Most joints are capable of several types of movement.

Muscles

- The three types of muscle tissue in the body are skeletal muscle, smooth muscle, and cardiac muscle.
- Muscles are composed of bundles of muscle fibers along with other tissues.
- Tendons attach muscles to bones in or near joints.

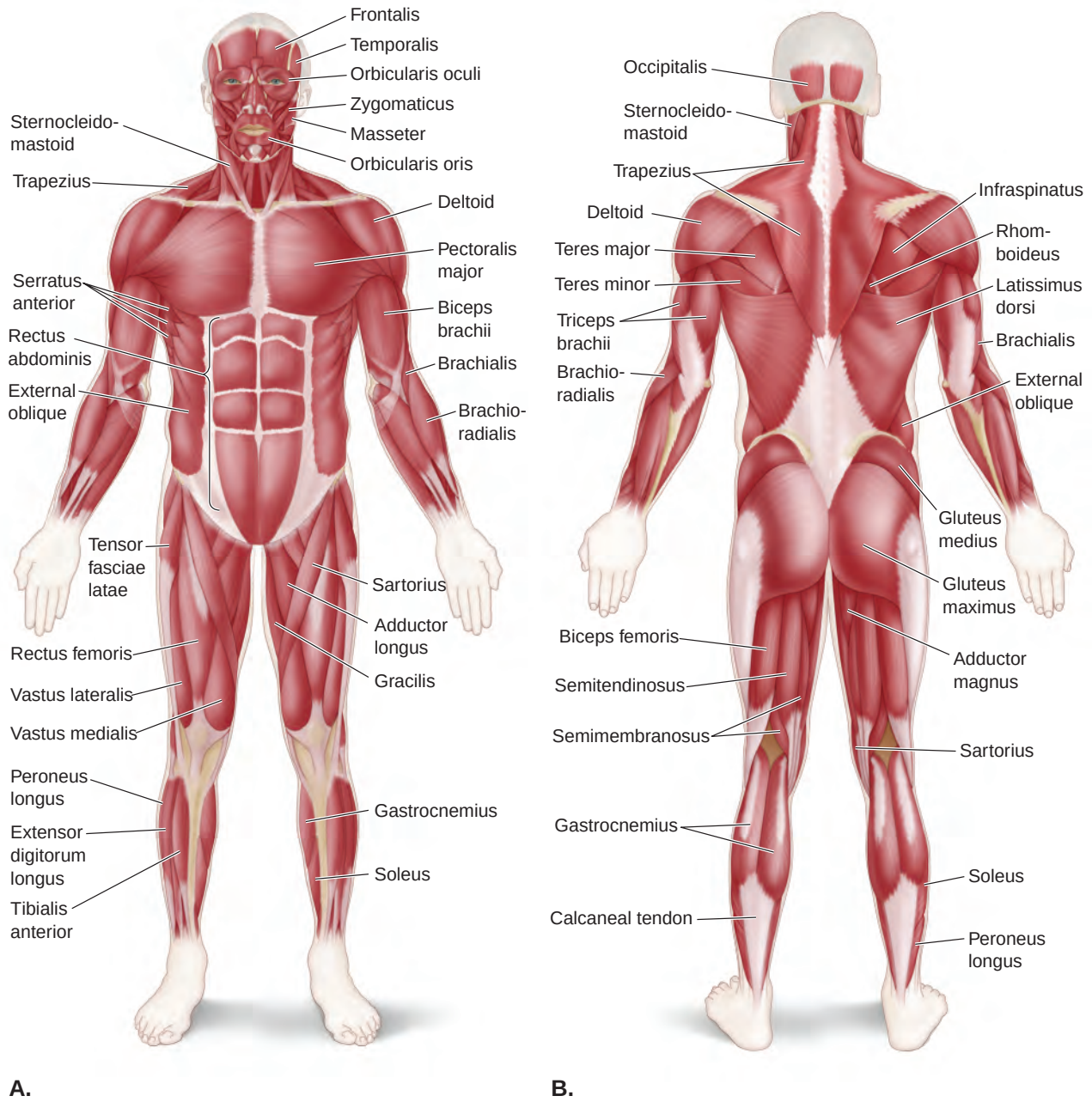

Figure 14-7 Skeletal muscles of the body. **A.** Anterior view. **B.** Posterior view.

Terms Related to Muscles (Fig. 14-7)

Term	Pronunciation	Meaning
agonist	ag′ŏn-ist	skeletal muscle that creates a movement by contracting; prime mover
antagonist	an-tag′ŏ-nist	skeletal muscle that opposes an agonist muscle and relaxes when the agonist contracts
cardiac muscle	kahr′dē-ak mŭs′ĕl	heart muscle (Fig. 14-8)
fascia	fash′ē-ă	sheet of connective tissue covering a muscle
fascicle	fas′i-kĕl	bundle of muscle fibers (Fig. 14-10)

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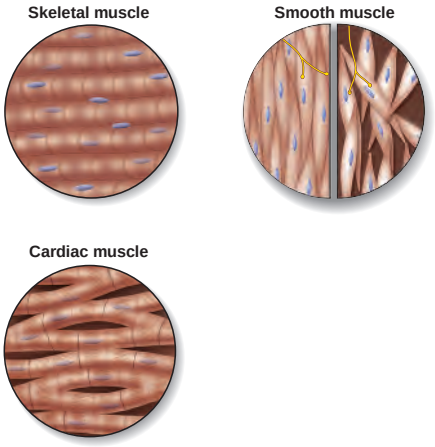

Figure 14-8 Muscles have varying internal characteristics depending on their function.

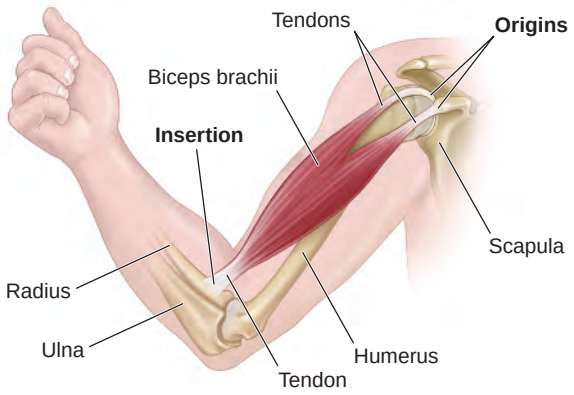

Figure 14-9 Muscles are attached to bones by tendons.

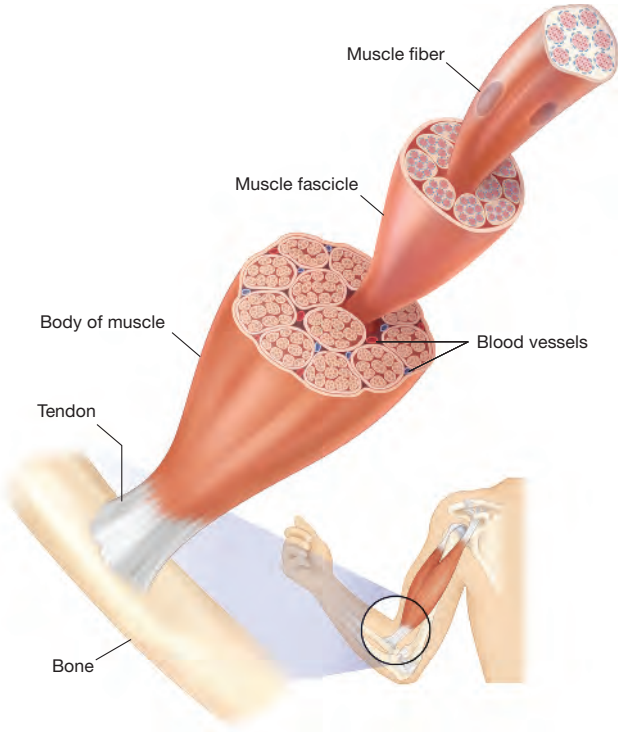

Figure 14-10 The structure of a skeletal muscle.

Terms Related to Muscles *(continued)*

Term	Pronunciation	Meaning
insertion of muscle	in-sĕr′shŭn mŭs′ĕl	end of muscle attached to bone that moves during contraction (Fig. 14-9)
origin of muscle	ōr′i-jin mŭs′ĕl	end of muscle attached to bone that does not move during contraction
smooth muscle, *syn.* unstriated muscle	smūth mŭs′ĕl, ŭn-strī′āt-ĕd mŭs′ĕl	type of muscle not under voluntary control; present in internal organs (Fig. 14-8)
skeletal muscle, *syn.* striated muscle	skel′ĕ-tăl mŭs′ĕl, strī′āt-ĕd mŭs′ĕl	type of muscle under voluntary control ("striated" refers to light and dark bands in muscle fibers) (Fig. 14-10, also Fig. 14-8)
tonus	tō′nŭs	muscle tone

Exercises: Anatomy and Physiology

Exercise 1

Write the correct anatomic structure for the definition given.

1. bone of upper arm _____
2. bones of the palm _____
3. shoulder blade _____
4. breast bone _____
5. shaft of long bone _____
6. attaches muscle to bone _____
7. bundle of muscle fibers _____
8. bone of the heel _____
9. bones of the skull, spine, chest _____
10. a bone of the spine _____

Exercise 2

Write the meaning of the term given.

1. abduction _____
2. ligament _____
3. articulation _____
4. dorsiflexion _____
5. acetabulum _____
6. cranium _____
7. mandible _____
8. synovial joint _____
9. maxilla _____
10. cartilage _____
11. epiphysial plate _____
12. ossa _____


SIMPLE RECALL

Exercise 3

Circle the term that is most appropriate for the meaning of the sentence.

1. A severe injury to the kneecap may involve a fractured (*cerebellum, patella, scapula*).
2. The cartilage structure in the knee is called the (*synovium, meniscus, bursa*).
3. Muscle tissue present in internal organs is (*unstriated, agonist, fascial*).
4. (*Synovial fluid, Endosteum, Fascia*) is a sheet of connective tissue covering a muscle.
5. The smaller bone in the lower leg is the (*femur, ulna, fibula*).
6. The (*epiphysis, ilium, patella*), or upper section of the pelvic bone, connects with the ischium and pubis.
7. The (*tibia, sacrum, lamina*) is a part of each vertebra.
8. The (*clavicle, metaphysis, radius*) articulates with the acromion at one end and the top of the sternum at the other end.
9. Between the diaphysis and the epiphysis of a long bone is the (*metaphysis, meniscus, diarthrosis*).
10. The large inner bone of the lower leg is the (*tibia, ulna, radius*).
11. A (*tendon, fascia, bursa*) is a fluid-filled fibrous sac within some joints.
12. The (*ischium, ilium, pubis*) is the posterior lower section of the pelvic bone, whereas the (*ischium, ilium, pubis*) is the anterior lower section of the pelvic bone.
13. The plural of vertebra is (*vertebrum, vertebras, vertebrae*).
14. The metatarsal bones are just distal to the (*tarsal, carpal, phalangeal*) bones.
15. Movement that decreases the joint angle is termed (*extension, flexion, inversion*).


ADVANCED RECALL

Exercise 4

Match each medical term with its meaning.

cancellous bone	ulna	carpal bones	endosteum	sacrum
intervertebral disk	radius	compact bone	ossa	osteocyte

Meaning	Term
1. membrane within medullary cavity	_____
2. strong solid bone tissue	_____
3. outer bone in lower arm	_____
4. eight bones of wrist	_____
5. spongy bone	_____
6. composed of fused vertebrae	_____
7. connective tissue between vertebrae	_____
8. inner bone in lower arm	_____

9. bones _____

10. bone cell _____

Exercise 5

Complete each sentence by writing in the correct medical term.

1. A patient with a broken collarbone has a fracture of the _____.
2. A fracture of the upper arm bone, the _____, is generally painful.
3. Bone tissue that is spongy and meshlike is called _____ bone.
4. A(n) _____ is a band of strong connective tissue that joins bones together at a joint.
5. The end of a muscle attached to bone that moves with contraction is called the _____ of the muscle.
6. A(n) _____ is a skeletal muscle that opposes a prime mover.
7. Skeletal muscle is _____, whereas smooth muscle is _____.
8. A freely moving joint is lubricated by _____ fluid.
9. The movement of turning the foot outward is called _____.
10. The type of immovable joint connecting skull bones is a(n) _____.
11. Bones in many types of joint are joined by _____, a dense connective tissue.
12. Just above the coccyx is the spinal structure called the _____.

WORD PARTS

Note that some word parts that have been introduced earlier in the book may not be repeated here.

Combining Forms

Combining Form	Meaning
ankyl/o	stiff
arthr/o, articul/o	joint
burs/o	bursa
carp/o	carpal bones
chondr/o	cartilage
clavic/o, clavicul/o	clavicle
cervic/o	neck
cost/o	rib
crani/o	cranium, skull

(continued)

Combining Forms *(continued)*

Combining Form	Meaning
disk/o	disk or disc
fasci/o	fascia, band
femor/o	femur
fibul/o	fibula
humer/o	humerus
ili/o	ilium
ischi/o	ischium
kinesi/o, kinet/o	movement
kyph/o	humpback
lei/o	smooth
lamin/o	lamina
lord/o	curved, bent
lumb/o	lumbar region, lower back
mandibul/o	mandible
maxill/o	maxilla
menisc/o	meniscus
my/o, myos/o, muscul/o	muscle
myel/o	bone marrow, spinal cord
oste/o	bone
patell/o	patella
pelv/i, pelv/o	pelvis, pelvic cavity
phalang/o	phalanges
pub/o	pubis
rachi/o	spine
radi/o	radius
rhabd/o	striated muscle
sacr/o	sacrum
scapul/o	scapula
scoli/o	crooked, twisted
stern/o	sternum
synovi/o	synovial joint or fluid
tars/o	tarsal bones
ten/o, tend/o, tendin/o	tendon
thorac/o	thorax, chest
ton/o	tone, tension
uln/o	ulna
vertebr/o, spondyl/o	vertebra

Prefixes

Prefix	Meaning
inter-	between
intra-	within
supra-	above
sub-	below, beneath
sym-, syn-	together, with

Suffixes

Suffix	Meaning
-algia	pain
-asthenia	weakness
-centesis	puncture to aspirate
-clasia, -clasis, -clast	to break
-desis	surgical fixation, binding
-ectomy	excision, surgical removal
-itis	inflammation
-osis	abnormal condition
-physis	growth
-plasty	surgical repair, reconstruction
-porosis	pore, passage
-rrhaphy	suture
-schisis	to split
-trophy	development, nourishment

Exercises: Word Parts

Exercise 6

Write the meaning of the combining form given.

1. crani/o _____
2. lumb/o _____
3. scoli/o _____
4. oste/o _____
5. stern/o _____

6. maxill/o _____
7. chondr/o _____
8. carp/o _____
9. ten/o, tend/o _____
10. spondyl/o _____
11. fasci/o _____
12. my/o, myos/o _____
13. mandibul/o _____
14. sacr/o _____
15. femor/o _____

Exercise 7

Write the correct combining form(s) for the meaning given.

1. rib _____
2. tarsal bones _____
3. smooth _____
4. fibula _____
5. bursa _____
6. joint _____
7. pelvis _____
8. chest _____
9. ischium _____
10. collarbone _____
11. lamina _____
12. neck _____
13. meniscus _____
14. phalanges _____

Exercise 8

Write the meaning of the prefix or suffix given.

1. -plasty _____
2. -asthenia _____
3. sub- _____
4. -desis _____
5. -ectomy _____
6. -physis _____
7. -rrhaphy _____
8. sym- _____
9. -schisis _____
10. -clasis _____

Exercise 9

Considering the meaning of the combining form from which the medical term is made, write the meaning of the medical term. (You have not yet learned many of these terms but can build their meaning from the word parts.)

Combining Form	Meaning	Medical Term	Meaning of Term
oste/o	bone	osteitis	1. _____
lord/o	bent (forward)	lordosis	2. _____
my/o	muscle	myalgia	3. _____
burs/o	bursa	bursitis	4. _____
maxill/o	maxilla	maxillitis	5. _____
scapul/o	scapula	subscapular	6. _____
pelv/i	pelvis	pelvic	7. _____
tend/o	tendon	tendonitis	8. _____
vertebr/o	vertebra	intervertebral	9. _____
arthr/o	joint	arthroplasty	10. _____

Exercise 10

Using the given combining form and a word part from the earlier tables, build a medical term for the meaning given.

Combining Form	Meaning of Medical Term	Medical Term
myos/o	inflammation of muscle	**1.** _____
crani/o	surgical repair of skull	**2.** _____
patell/o	excision of patella	**3.** _____
ten/o	suture of tendon	**4.** _____
arthr/o	pain in a joint	**5.** _____
crani/o	pertaining to within the skull	**6.** _____
tars/o	excision of tarsal bone	**7.** _____
menisci/o	inflammation of a meniscus	**8.** _____
disk/o	excision of intervertebral disk	**9.** _____
chondr/o	surgical repair of cartilage	**10.** _____

MEDICAL TERMS

Adjectives and Other Related Terms

Term	Pronunciation	Meaning
carpal	kahr′păl	pertaining to the carpal bones
costovertebral	kos′tō-vĕr′tĕ-brăl	pertaining to the ribs and thoracic vertebrae
cranial	krā′nē-ăl	pertaining to the skull
femoral	fem′ŏr-ăl	pertaining to the femur
humeral	hyū′mĕr-ăl	pertaining to the humerus
iliofemoral	il′ē-ō-fem′ŏr-ăl	pertaining to the ilium and femur
intercostal	in′tĕr-kos′tăl	pertaining to the area between the ribs
intervertebral	in′tĕr-vĕr′tĕ-brăl	pertaining to the area between vertebrae
intracranial	in-tră-krā′nē-ăl	pertaining to the area within the skull
ischiofemoral	is′kē-ō-fem′ŏr-ăl	pertaining to the ischium and femur
lumbar	lŭm′bahr	pertaining to the lower back
lumbocostal	lŭm′bō-kos′tăl	pertaining to the lumbar vertebrae and ribs

(continued)

Adjectives and Other Related Terms *(continued)*

Term	Pronunciation	Meaning
lumbosacral	lŭm′bō-sā′krăl	pertaining to the lumbar vertebrae and sacrum
osseous	os′ē-ŭs	pertaining to bone
pelvic	pel′vik	pertaining to the pelvis or pelvic cavity
sacral	sā′krăl	pertaining to the sacrum
sacrovertebral	sā′krō-vĕr′tĕ-brăl	pertaining to the sacrum and the vertebrae above
sternoclavicular	stĕr′nō-klă-vik′yū-lăr	pertaining to the sternum and clavicle
sternoid	stĕr′noyd	resembling the sternum
subcostal	sŭb-kos′tăl	pertaining to the area below a rib or the ribs
submandibular	sŭb′man-dib′yū-lăr	pertaining to the area below the mandible
submaxillary	sŭb-mak′si-lar-ē	pertaining to the area below the maxilla
subscapular	sŭb-skap′yū-lăr	pertaining to the area below the scapula
substernal	sŭb-stĕr′năl	pertaining to the area below the sternum
suprapatellar	sū′pră-pă-tel′ăr	pertaining to the area above the patella
suprascapular	sū′pră-skap′yū-lăr	pertaining to the area above the scapula
synovial	si-nō′vē-ăl	pertaining to, containing, or consisting of synovial fluid

Exercises: Adjectives and Other Related Terms

Exercise 11

Circle the term that is most appropriate for the meaning of the sentence.

1. An (*iliofemoral, ischiopubic, intercostal*) wound is located between the ribs.
2. A broken upper leg bone is called a (*humeral, cranial, femoral*) fracture.
3. A herniated (*intervertebral, carpal, sternoclavicular*) disk involves an injury to the disks between the vertebrae.
4. The (*ischiofemoral, lumbocostal, subscapular*) area includes both the ischium and femur.
5. Diagnosing a knee condition may require a needle puncture to draw (*submaxillary, sternoid, synovial*) fluid for testing.
6. A(n) (*substernal, pelvic, osseous*) examination includes all of the organs in the pelvis.
7. The area below the shoulder blade is called the (*subcostal, pubofemoral, subscapular*) region.
8. A wrist injury may involve a (*carpal, subcostal, sternoid*) fracture.

ADVANCED RECALL

Exercise 12

Match each medical term with its meaning.

substernal	costovertebral	intracranial	intervertebral
lumbar	submandibular	suprapatellar	sacral
humeral	lumbosacral	intercostal	cranial

Meaning	Term
1. pertaining to the humerus	_____
2. pertaining to the area between ribs	_____
3. pertaining to the area below the sternum	_____
4. pertaining to the area above the patella	_____
5. pertaining to the skull	_____
6. pertaining to the sacrum	_____
7. pertaining to the area between vertebrae	_____
8. pertaining to the area within the skull	_____
9. pertaining to the lower back	_____
10. pertaining to the ribs and thoracic vertebrae	_____
11. pertaining to the area below the mandible	_____
12. pertaining to the lumbar vertebrae and sacrum	_____

Symptoms and Medical Conditions

Term	Pronunciation	Meaning
ankylosing spondylitis	ang′ki-lōs-ing spon′di-lī′tis	arthritis of the spine
ankylosis	ang′ki-lō′sis	abnormal condition of stiffening or fixation of a joint
arthralgia	ahr-thral′jē-ă	condition of pain in a joint
arthritis	ahr-thrī′tis	inflammation of a joint (Fig. 14-11)
arthrochondritis	ahr′thrō-kon-drī′tis	inflammation of an articular cartilage
atrophy	at′rŏ-fē	a wasting of tissue or an organ
bradykinesia	brad′ē-kin-ē′sē-ă	condition of decreased movement
bunion	bŭn′yŏn	swelling at metatarsophalangeal joint caused by inflammatory bursa
bursitis	bŭr-sī′tis	inflammation of a bursa
bursolith	bŭr′sō-lith	a calculus (stone) formed in a bursa

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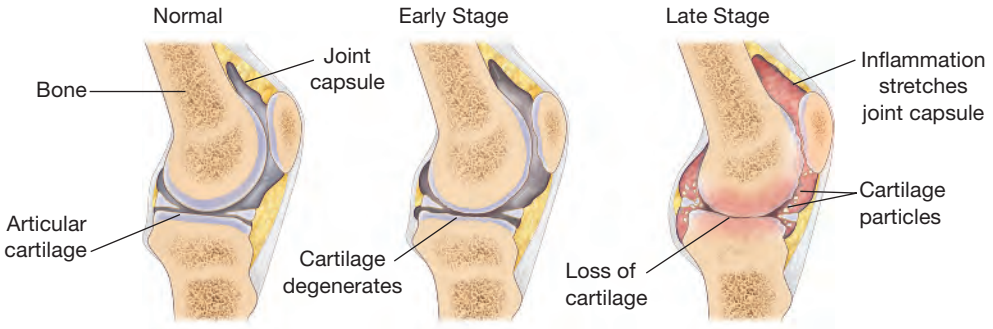

Figure 14-11 Progressive joint changes in arthritis of the knee.

Symptoms and Medical Conditions *(continued)*

Term	Pronunciation	Meaning
carpal tunnel syndrome (CTS)	kahr′păl tŭn′ĕl sin′drōm	nerve entrapment syndrome in the wrist, causing pain
carpoptosis, *syn.* wrist-drop	kar′pop-tō′sis, rist drop	paralysis of wrist and finger muscles
chondromalacia	kon′drō-mă-lā′shē-ă	softening of a cartilage
cranioschisis	krā′nē-os′ki-sis	congenital incomplete closure of the skull
curvature of the spine	kŭr′vă-chŭr spīn	abnormal curving of the spine in one or more directions (Fig. 14-12)
kyphosis	kī-fō′sis	abnormal forward curvature; humpback
lordosis	lōr-dō′sis	abnormal backward curvature
scoliosis	skō′lē-ō′sis	abnormal lateral curvature
dyskinesia	dis′ki-nē′sē-ă	difficulty performing voluntary movements

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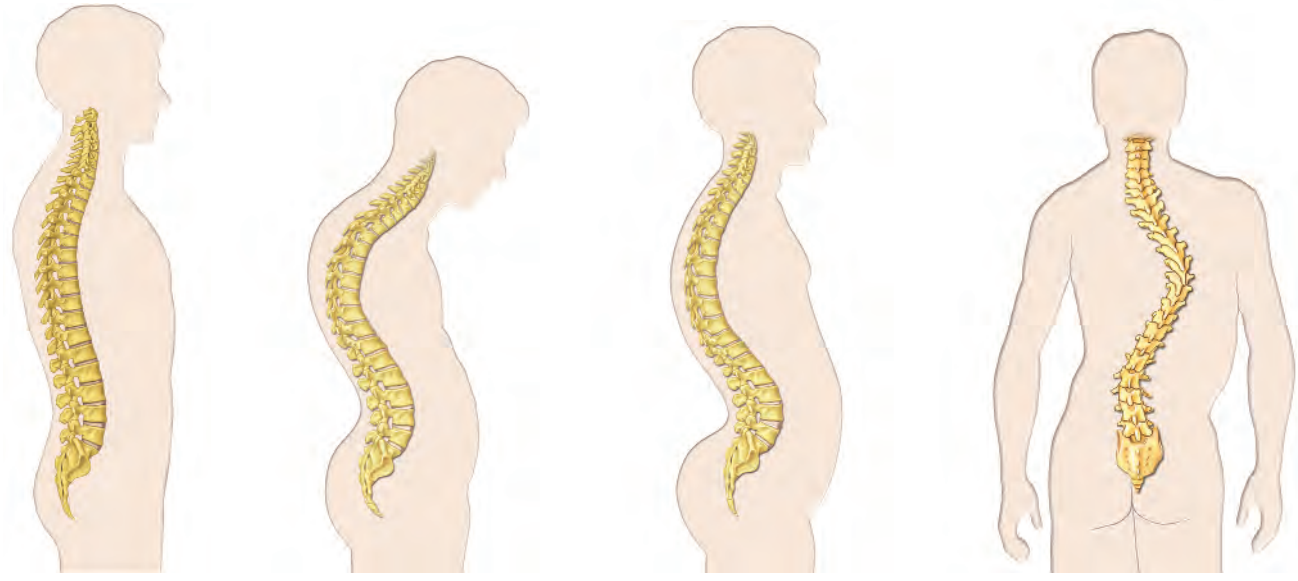

A. Normal **B.** Kyphosis **C.** Lordosis **D.** Scoliosis

Figure 14-12 Curvatures of the spine can cause pain and disfigurement.

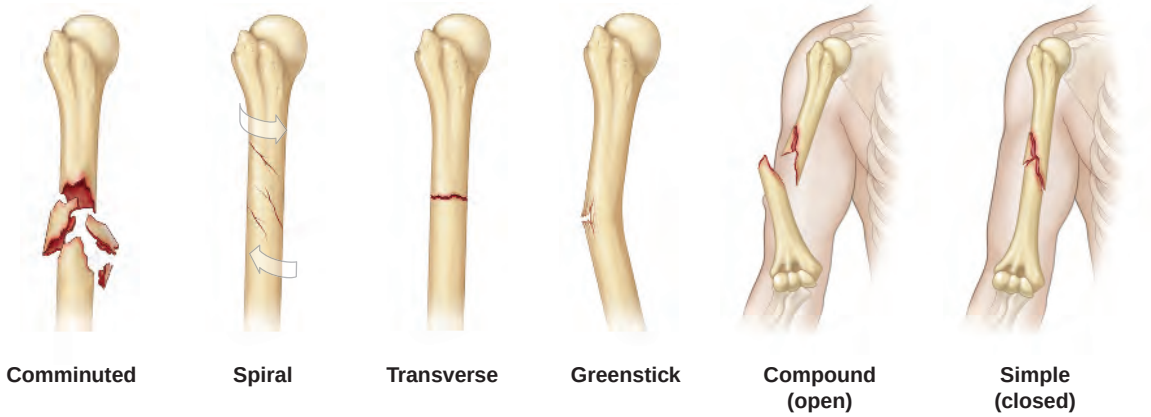

Figure 14-13 Common types of fractures.

Symptoms and Medical Conditions *(continued)*

Term	Pronunciation	Meaning
dystrophy	dis′trŏ-fē	abnormal development or growth of a tissue or organ often resulting from nutritional deficiency
exostosis	eks′os-tō′sis	bony projection that develops from cartilage
fibromyalgia	fī′brō-mī-al′jē-ă	condition of chronic aching and stiffness of muscles and soft tissues of unknown cause
fracture (fx)	frak′shŭr	a break in a bone or cartilage (Figs. 14-13 and 14-14)
gout	gowt	metabolic disorder involving painful deposits of crystals in connective tissue and articular cartilage

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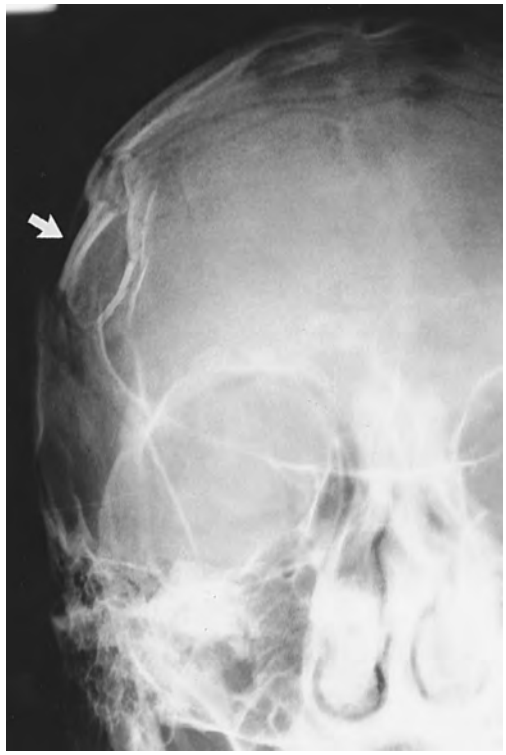


Figure 14-14 Depressed skull fracture.

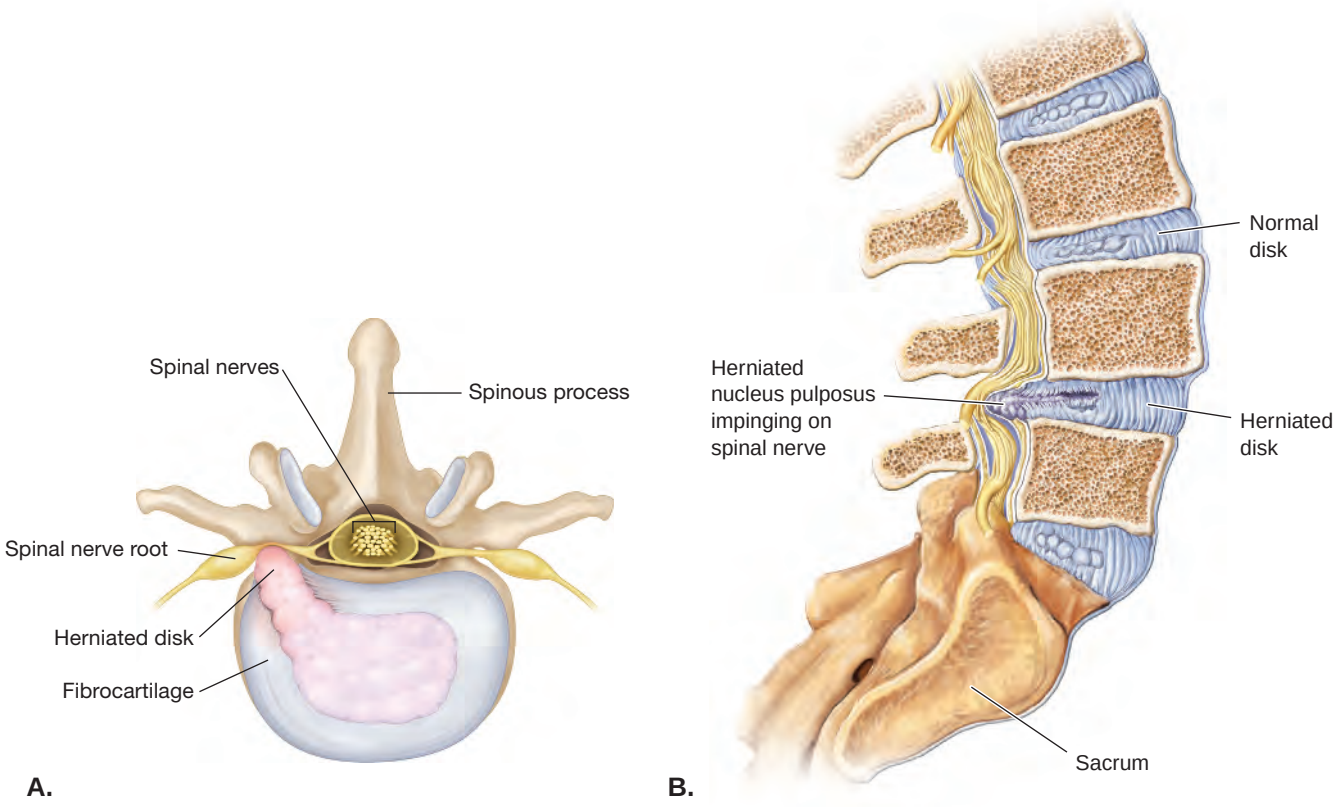


Figure 14-15 Protrusion of a herniated disk through the fibrocartilage. **A.** Cross-section view. **B.** Lateral view.

Symptoms and Medical Conditions *(continued)*

Term	Pronunciation	Meaning
herniated disk (or disc)	hĕr′nē-ā-tĕd disk	protrusion of a degenerated or fragmented intervertebral disk (Fig. 14-15)
hyperkinesia	hī′pĕr-ki-nē′zē-ă	condition of excessive muscular movements
hypertrophy	hī-pĕr′trō-fē	increased development of a part or organ not caused by a tumor
maxillitis	mak′si-lī′tis	inflammation of the maxilla
meniscitis	men-i-sī′tis	inflammation of a meniscus
muscular dystrophy (MD)	mŭs′kyū-lăr dis′trŏ-fē	hereditary condition causing progressive degeneration of skeletal muscles

MUSCULAR DYSTROPHY While there are several variations of muscular dystrophy, there are two prominent types. They are called Becker and Duchenne. Both of these are X-linked, which means the mother can pass along this genetic mutation to the children. However, muscular dystrophy affects more boys than girls.

myalgia	mī-al′jē-ă	condition of muscular pain
myasthenia gravis (MG)	mī-as-thē′nē-ă gra′vis	condition of neuromuscular disorder causing weakness and fatigue of voluntary muscles
myositis	mī-ō-sī′tis	inflammation of a muscle
osteitis	os-tē-ī′tis	inflammation of bone

(continued)

Symptoms and Medical Conditions *(continued)*

Term	Pronunciation	Meaning
osteoarthritis (OA)	os′tē-ō-ahr-thrī′tis	arthritis involving erosion and inflammation of articular cartilage
osteochondritis	os′tē-ō-kon-drī′tis	inflammation of a bone and its articular cartilage
osteomalacia	os′tē-ō-mă-lā′shē-ă	condition of softening of bones
osteomyelitis	os′tē-ō-mī-ĕ-lī′tis	inflammation of bone marrow
osteonecrosis	os′tē-ō-nĕ-krō′sis	condition or process of bone tissue death
osteoporosis	os′tē-ō-pŏr-ō′sis	age-related disorder of decreased bone mass and weakening (Fig. 14-16)
polymyositis	pol′ē-mī′ō-sī′tis	inflammation of multiple voluntary muscles
rachischisis	ră-kis′ki-sis	embryologic failure of vertebral arches to fuse
rheumatoid arthritis (RA)	rū′mă-toyd ahr-thrī′tis	disease causing progressive destructive changes and inflammation in multiple joints, especially in the hands and feet (Fig. 14-17)
rickets	rik′ĕts	disease caused by vitamin D deficiency, involving skeletal deformities and muscular weakness
spondylarthritis	spon′dil-ahr-thrī′tis	inflammation of intervertebral articulations
sprain	sprān	injury of a ligament caused by abnormal or excessive forces on a joint
strain	strān	injury of a muscle caused by overuse or improper use
tendonitis, tendinitis	ten′dŏ-nī′tis, ten′di-nī′tis	inflammation of a tendon
tenodynia	ten-ō-din′ē-ă	condition of pain in a tendon
tenosynovitis	ten′ō-sin-ō-vī′tis	inflammation of a tendon and its sheath

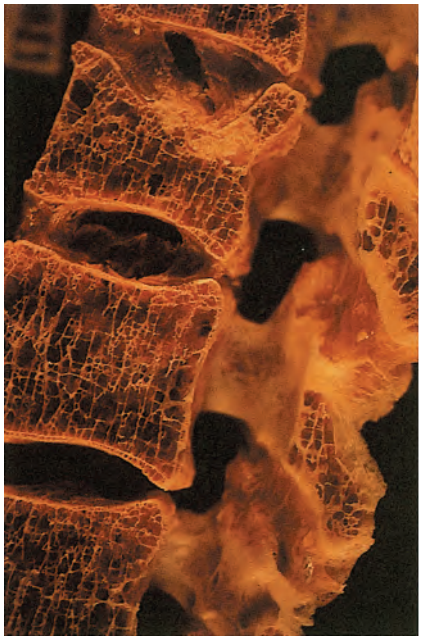


Figure 14-16 Bone becomes less dense in osteoporosis.

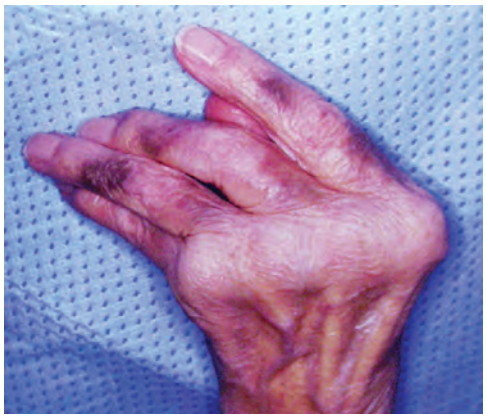
A.  B. 

Figure 14-17 The changes of severe rheumatoid arthritis. **A.** X-ray of normal hand. **B.** Hand severely deformed from rheumatoid arthritis.

Exercises: Symptoms and Medical Conditions

Exercise 13

Write the correct medical term for the definition given.

1. abnormal lateral curvature of spine _____
2. inflamed tendon _____
3. break in a bone _____
4. softening of cartilage _____
5. inflamed bursa _____
6. decreased bone mass _____
7. disease caused by vitamin D deficiency _____
8. pain in a tendon _____
9. inflamed intervertebral articulations _____
10. arthritis of the spine _____

11. abnormal forward curvature of spine _____

12. pain in a joint _____

13. inflammation of a joint _____

14. softening of bone _____


ADVANCED RECALL

Exercise 14

Circle the term that is most appropriate for the meaning of the sentence.

1. Mrs. Jones presented with weakness and fatigue in her voluntary muscles, and, after clinical study, her physician diagnosed her condition as (*myasthenia, myalgia, myositis*) gravis.

2. Mr. Carelton was seen in follow-up for his condition of inflammation of multiple voluntary muscles, also called (*polymyositis, carpal tunnel syndrome, atrophy*).

3. Dr. Gonzalez informed Mr. Lawson that when (*gout, fibromyalgia, osteitis*) occurs, crystals are deposited in connective tissue and articular cartilage.

4. Young Bridget LaRoux suffered a(n) (*sprain, strain, atrophy*) to her calf muscle and a(n) (*sprain, strain, atrophy*) to one of her ligaments.

5. Mrs. Anderson suffers from progressive destructive changes in multiple joints caused by (*muscular dystrophy, rheumatoid arthritis, myasthenia gravis*).

6. After spending years in chronic pain without a known cause, the patient was diagnosed with (*fibromyalgia, gout, hypertrophy*).

7. After his x-ray report showed a stone in his elbow area, the patient was told that he had a(n) (*bunion, bursolith, exostosis*).

8. Mrs. Gabai had (*atrophy, hypertrophy, dystrophy*) of her lower limbs after spending many years in a wheelchair.

9. The physician diagnosed Ms. Allen with (*carpal, metacarpal, tarsal*) tunnel syndrome after she complained of pain in her wrist after many years of repetitive work.

10. Mr. Kowalski suffered from (*osteitis, dyskinesia, exostosis*) after his stroke.

11. After reporting pain in his left throwing arm, the baseball player was diagnosed with inflammation of a tendon and its sheath, also called (*tenosynovitis, tenodynia, osteochondritis*).


TERM CONSTRUCTION

Exercise 15

Build a medical term from an appropriate combining form and suffix, given their meanings.

Use Combining Form for	Use Suffix for	Term
1. joint	inflammation	_____
2. joint	pain	_____

3. spine	split	_____
4. maxilla	inflammation	_____
5. tendon	pain	_____
6. bursa	inflammation	_____
7. muscle	pain	_____
8. joint and cartilage	inflammation	_____
9. bone	softening	_____

Exercise 16

Break the given medical term into its word parts and define each part. Then define the medical term. (Note: This exercise uses some suffixes learned previously.)

For example:
arthritis
word parts: arthr/o / -itis
meanings: joint / inflammation
term meaning: inflammation of a joint

1. hypertrophy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

2. scoliosis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

3. cranioschisis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

4. carpoptosis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

5. ankylosis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

6. bursolith
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

7. atrophy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

8. osteitis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

9. bradykinesia
word parts: _____ / _____ / _____
meanings: _____ / _____ / _____
term meaning: _____

10. polymyositis
word parts: _____ / _____ / _____
meanings: _____ / _____ / _____
term meaning: _____

Tests and Procedures

Term	Pronunciation	Meaning
Laboratory Tests		
creatine kinase (CK)	krē′ă-tin kī′nās	test for the presence of the enzyme creatine kinase in the blood that may indicate conditions that can cause muscle weakness or pain
erythrocyte sedimentation rate (ESR)	ĕ-rith′rŏ-sīt sed′i-mĕn-tā′shŭn rāt	time measurement of red blood cells settling in a test tube over 1 hour; used to assess for inflammatory or necrotic conditions
rheumatoid factor (RF)	rū′mă-toyd fak′tŏr	blood test used to help diagnose rheumatoid arthritis
synovial fluid analysis	si-nō′vē-ăl flū′id ă-nal′i-sis	test for the presence of crystals caused by some conditions, such as arthritis, and also signs of joint infection
uric acid	yūr′ik as′id	test for elevated presence of uric acid in the blood, indicating gout
Diagnostic Procedures		
arthrography	ahr-throg′ră-fē	x-ray imaging of a joint using a contrast agent
arthroscopy	ahr-thros′kŏ-pē	endoscopic examination of the interior of a joint (Fig. 14-18)
bone densitometry	dens′i-tom′ĕ-trē	x-ray technique for determining density of bone
bone scan	bōn skan	nuclear medicine imaging of bone to diagnose bone disorders (Fig. 14-19)

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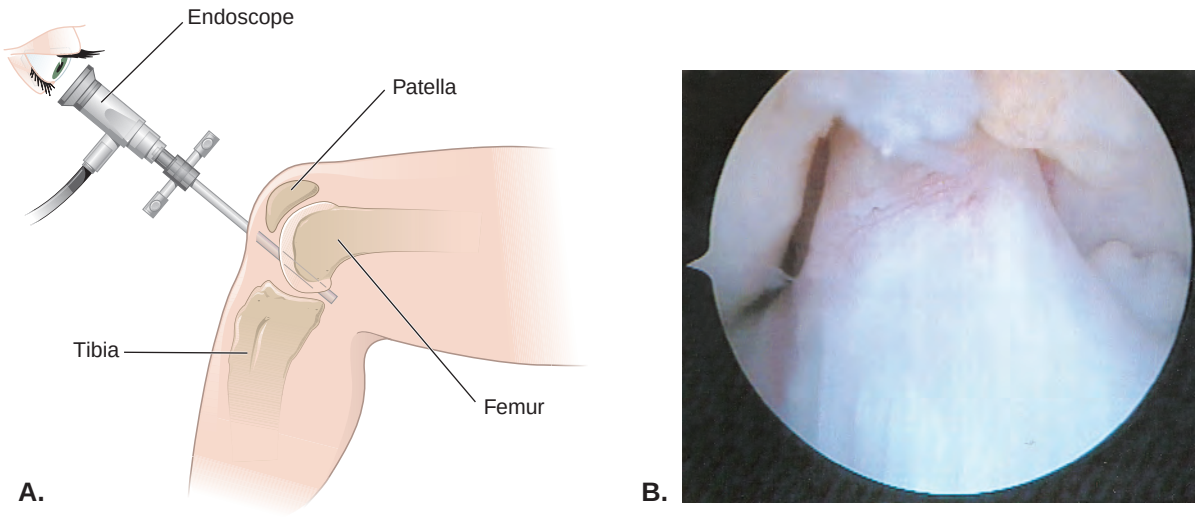

Figure 14-18 **A.** Arthroscopic examination of the knee. **B.** Endoscopic view of joint interior.

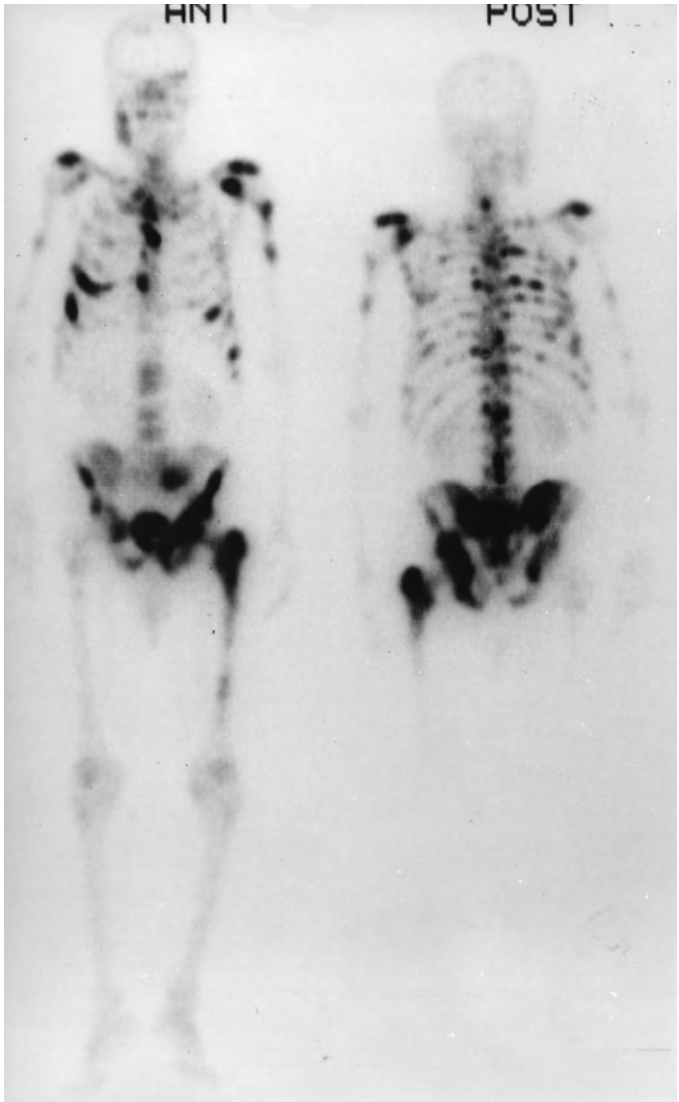

Figure 14-19 Whole body nuclear medicine bone scan.

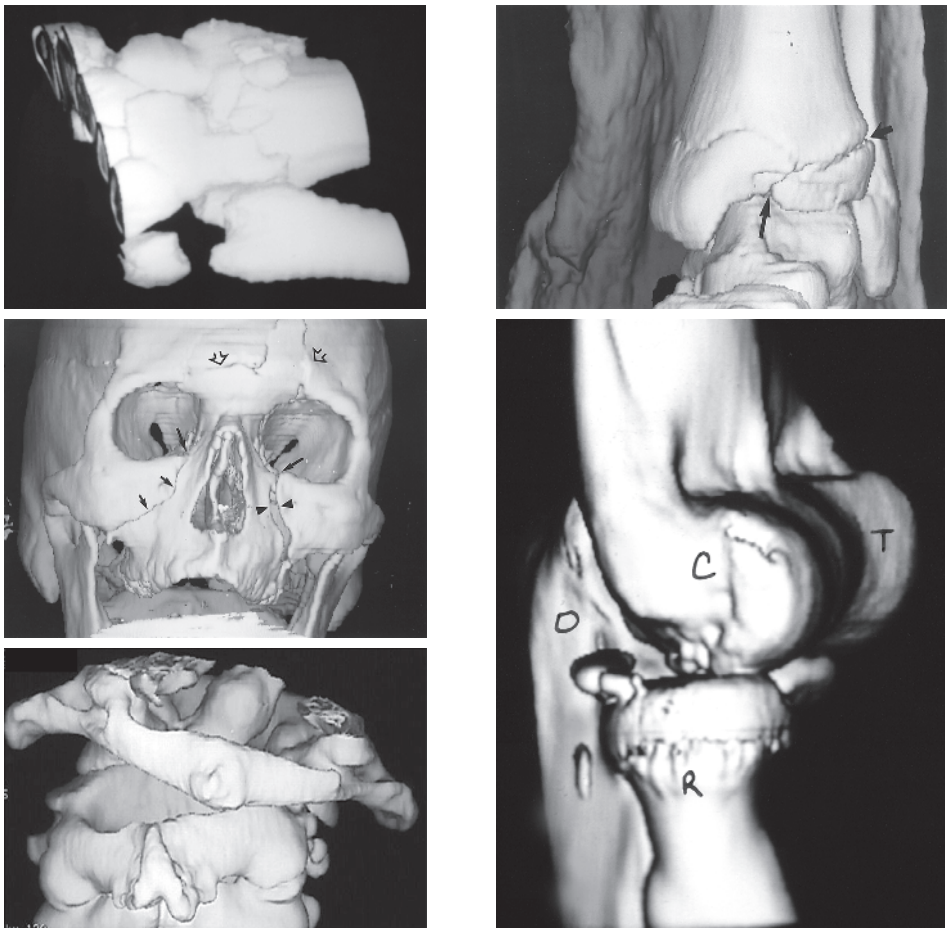

Figure 14-20 Computed tomography (CT) scans with three-dimensional reconstruction demonstrating different types of fractures.

Tests and Procedures *(continued)*

Term	Pronunciation	Meaning
computed tomography (CT)	kŏm-pyū'tĕd tŏ-mog'ră-fē	x-ray technique producing computer-generated cross-sectional images; used to evaluate disorders of and injuries to the musculoskeletal system (Fig. 14-20)
electromyogram (EMG)	ĕ-lek'trō-mī'ō-gram	diagnostic test producing graphic record of electric currents associated with muscular action (Fig. 14-21)
magnetic resonance imaging (MRI)	mag-net'ik rez'ō-năns im'ăj-ing	imaging technique that uses magnetic fields and radiofrequency waves to visualize anatomic structures; often used for diagnosing joint disorders (Fig. 14-22)
radiography	rā'dē-og'ră-fē	examination of any part of the body by x-ray
range of motion (ROM) testing	rānj mō'shŭn	measurement of the amount of movement allowed in a joint

Range of motion testing is done to assess a patient's joint motion, and range of motion exercises are used to preserve or increase the amount of movement allowed in a joint. An instrument called a goniometer measures the range of motion of a joint.

Figure 14-21 Electromyography.

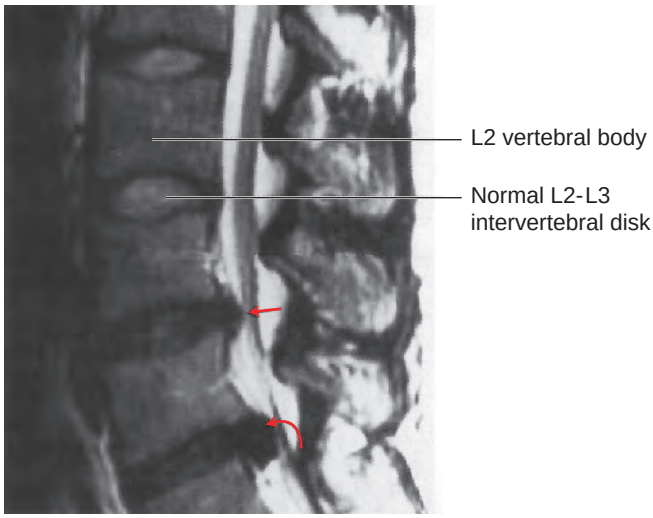

Figure 14-22 Magnetic resonance imaging (MRI) of a herniated intervertebral disk (*arrows*).

Exercises: Tests and Procedures

Exercise 17

ADVANCED RECALL

Circle the term that is most appropriate for the meaning of the sentence.

1. Wanting a cross-sectional view of the lateral meniscus, the orthopedist ordered a procedure using (*computed tomography, arthroscopy, range of motion testing*).

2. A record of the electrical currents associated with muscular action is called a(n) (*arthrogram, radiograph, electromyogram*).

3. (*Magnetic resonance imaging, Arthroscopy, Arthrography*) is a radiographic technique for imaging a joint, usually after administering a contrast agent.

4. A bone scan is produced with (*nuclear medicine imaging, endoscopy, arthrography*).

5. The examination of any part of the body by x-ray is called (*radiography, electromyography, computed tomography*).

6. The laboratory test for (*creatine kinase, rheumatoid factor, uric acid*) may help diagnose conditions that cause muscle weakness and pain.

7. (*Rheumatoid factor, Uric acid, Creatine kinase*) is the laboratory test that indicates gout.

8. The laboratory test that will help determine the presence of rheumatoid arthritis is called (*erythrocyte sedimentation rate, uric acid, rheumatoid factor*).

Exercise 18

ADVANCED RECALL

Complete each sentence by writing in the correct medical term.

1. The radiographic technique used to determine bone density is called _____.

2. The amount of movement a joint allows can be determined by _____.

3. The use of nuclear medicine imaging of bone to diagnose bone disorders is called a(n) _____.

4. An interior joint space can be viewed through an endoscope in _____.

5. The diagnostic modality based on the effects of a magnetic field on body tissues is called _____.

6. The laboratory test that can indicate inflammation in the body is called _____.

7. The laboratory test that may detect crystals caused by certain conditions and also signs of joint infection is called _____.

Surgical Interventions and Therapeutic Procedures

Term	Pronunciation	Meaning
arthrocentesis	ahr′thrō-sen-tē′sis	needle puncture to remove fluid from a joint (Fig. 14-23)
arthroclasia	ahr′thrō-klā′zē-ă	surgical breaking of adhesions in ankylosis
arthrodesis	ahr-throd′ĕ-sis	surgical artificial stiffening of a joint
arthroplasty	ahr′thrō-plas-tē	surgical restoration of joint function or creation of an artificial joint (such as a total hip or knee replacement)
bursectomy	bŭr-sek′tŏ-mē	excision of a bursa
carpectomy	kahr-pek′tŏ-mē	excision of part or all of the carpal bones
chondrectomy	kon-drek′tŏ-mē	excision of cartilage
chondroplasty	kon′drō-plas-tē	surgical repair of cartilage
costectomy	kos-tek′tŏ-mē	excision of a rib
cranioplasty	krā′nē-ō-plas-tē	surgical repair of the skull
craniotomy	krā′nē-ot′ŏ-mē	surgical creation of an opening (incision) into the skull
diskectomy	disk-ek′tŏ-mē	excision of part or all of an intervertebral disk (Fig. 14-24)
laminectomy	lam′i-nek′tŏ-mē	excision of a vertebral lamina
laminotomy, *syn.* rachiotomy	lam-i-not′ŏ-mē, rā′kē-ot′ŏ-mē	enlargement of the intervertebral foramen by excision of a portion of the lamina
maxillotomy	mak′si-lot′ŏ-mē	surgical resection of the maxilla

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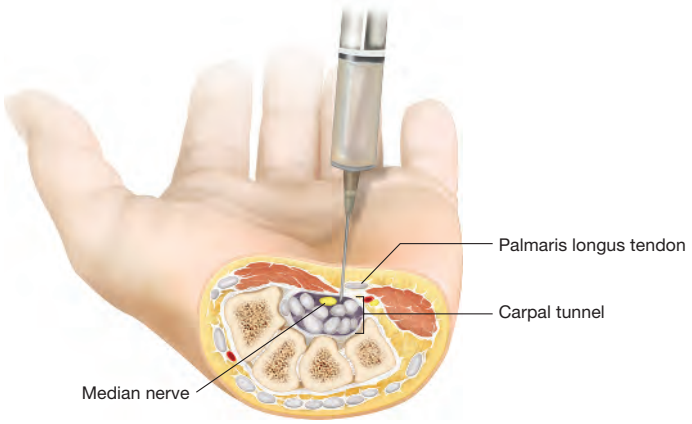

Figure 14-23 In arthrocentesis, synovial fluid is aspirated from the wrist joint to reduce inflammation.

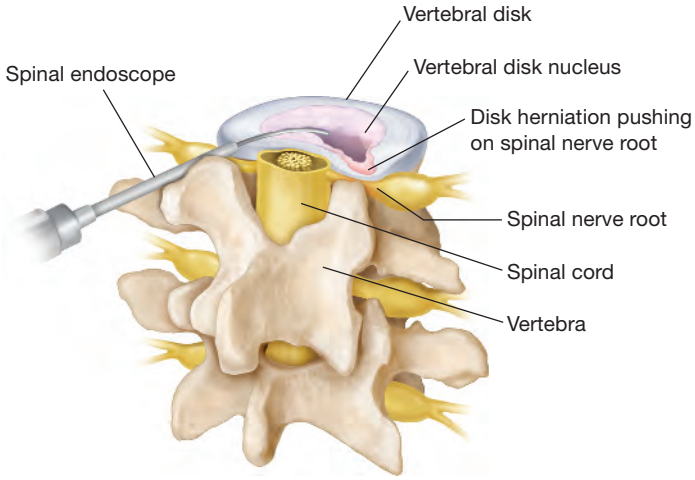

Figure 14-24 Surgical excision of a tissue from a herniated disk (diskectomy).

Figure 14-25 Surgical fixation is done to produce spinal fusion (spondylosyndesis) and limit patient movement.

Surgical Interventions and Therapeutic Procedures *(continued)*

Term	Pronunciation	Meaning
meniscectomy	men'i-sek'tŏ-mē	excision of a meniscus, usually from the knee joint
myoplasty	mī'ō-plas-tē	surgical repair of muscular tissue
myorrhaphy	mī-ōr'ă-fē	suture of a muscle
open reduction, internal fixation (ORIF)	ō'pĕn rĕ-duk'shŭn, in-tĕr'năl fik-sā'shŭn	surgical repair of a fracture by making an incision into the skin and muscle at the site of the fracture, manually moving the bones into alignment, and fixing the bones in place with surgical wires, screws, pins, rods, or plates
ostectomy	os-tek'tŏ-mē	excision of bone tissue
osteoclasis	os-tē-ok'lă-sis	intentional fracture of a bone to correct deformity
osteoclast	os'tē-ō-klast	surgical instrument used to fracture a bone to correct a deformity
patellectomy	pat-ĕ-lek'tŏ-mē	excision of the patella
phalangectomy	fal-an-jek'tŏ-mē	excision of one or more phalanges of the hand or foot

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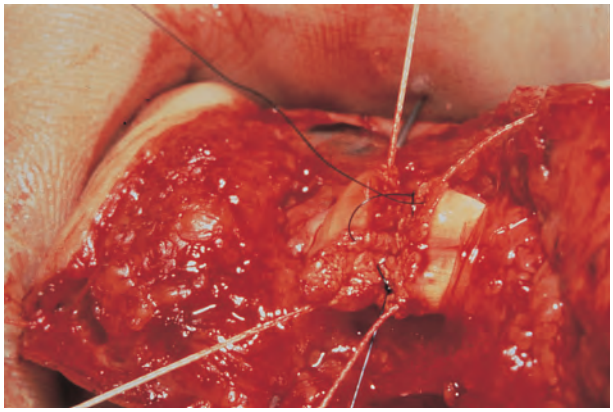


Figure 14-26 Suturing a torn tendon (tenorrhaphy).

Surgical Interventions and Therapeutic Procedures *(continued)*

Term	Pronunciation	Meaning
reduction	rĕ-dŭk′shŭn	manipulative or surgical procedure to restore a part to its normal position, such as by reducing a fracture (putting bone ends back in place)
spondylosyndesis	spon′di-lō-sin-dē′sis	surgical procedure to create ankylosis between two or more vertebrae (Fig. 14-25); also called spinal fusion
synovectomy	sin′ō-vek′tŏ-mē	excision of part or all of a joint's synovial membrane
tarsectomy	tahr-sek′tŏ-mē	excision of part or all of the tarsal bones
tenorrhaphy	te-nōr′ă-fē	suture of the divided ends of a tendon (Fig. 14-26)
traction	trak′shŭn	a pulling force exerted on a limb or other part of the body to maintain a desired position for healing (Fig. 14-27)

(continued)

Figure 14-27 Cervical traction.

Figure 14-28 Orthopedic devices (orthoses). **A.** Knee brace. **B.** Back brace.

Surgical Interventions and Therapeutic Procedures *(continued)*

Term	Pronunciation	Meaning
	Related Terms	
orthosis	ōr-thō′sis	external orthopedic device, such as a brace or splint (Fig. 14-28)
prosthesis	pros-thē′sis	fabricated substitute for a damaged or missing part of the body

Osteoclast: "Osteoclast" has two meanings in medicine: (i) a body cell that helps remove osseous tissue and (ii) a surgical instrument used to fracture a bone to correct a deformity. The correct definition depends on the context in which it is used. For example, the first definition might be used in a laboratory report, and the second definition might be used in an operative report.

Exercises: Surgical Interventions and Therapeutic Procedures

Exercise 19

Write the correct medical term for the definition given.

1. excision of some or all of a synovial membrane _____
2. putting bone ends back in their proper place _____
3. suture of a muscle _____
4. excision of cartilage _____
5. surgical breaking of adhesions in ankylosis _____

6. excision of an intervertebral disk _____
7. pulling force exerted on a limb _____
8. surgical repair of skull _____
9. spinal fusion _____
10. intentional fracture to correct bone deformity _____
11. excision of the patella _____
12. surgical instrument used to break a bone _____
13. surgical repair of cartilage _____
14. excision of a meniscus _____
15. surgical resection of the maxilla _____
16. surgical creation of an artificial joint _____

Exercise 20

Circle the term that is most appropriate for the meaning of the sentence.

1. Mrs. Yin required a(n) (*cranioplasty, arthrodesis, ostectomy*) to excise a cancerous bone growth.
2. Mr. Behringer had a very painful bursa but was, nonetheless, reluctant to undergo (*arthroplasty, bursectomy, laminectomy*) to remove it.
3. The first step of surgery for Ms. Barbosa's brain tumor was a (*craniotomy, cranioplasty, costectomy*).
4. Following surgical removal of a sarcoma that had spread through his vastus medialis muscle, Mr. McCarty required extensive (*tenorrhaphy, myoplasty, arthrodesis*) to repair the muscle.
5. To brace her leg and provide support while healing occurred, Mrs. Ahern needed to wear a custom (*osteoclasis, arthrodesis, orthosis*) at all times.
6. After breaking her arm, Mrs. Latta had a(n) (*meniscectomy; open reduction, internal fixation; osteoclast*) to repair the fracture.
7. Mr. Karposky's surgery for a herniated intervertebral disk included (*carpectomy, tarsectomy, laminectomy)*.
8. During surgery for the skier's injured knee, Dr. Tanaka discovered a tendon that had completely divided and had to perform (*phalangectomy, tenorrhaphy, arthroclasia*).
9. With (*arthrocentesis, arthrodesis, chondrectomy*), the orthopedic surgeon aspirated synovial fluid from Mrs. Updike's severely swollen shoulder joint.
10. Within months of the emergency amputation of her gangrenous left leg, Ms. Pappas was adapting well to walking using a (*spondylosyndesis, prosthesis, traction*).

Exercise 21

Using the given suffix, build a medical term for the meaning given.

Suffix	Meaning of Medical Term	Medical Term
-plasty	surgical repair of muscle	**1.** _____
-ectomy	excision of cartilage	**2.** _____
-desis	surgical fixation or binding of a joint	**3.** _____
-rrhaphy	suture of divided ends of a tendon	**4.** _____
-tomy	incision into the skull	**5.** _____

Exercise 22

Break the given medical term into its word parts and define each part. Then define the medical term.

For example:
arthritis
word parts: arthr/o / -itis
meanings: joint / inflammation
term meaning: inflammation of a joint

1. osteoclasis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

2. myorrhaphy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

3. arthroplasty
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

4. phalangectomy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

5. rachiotomy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

6. diskectomy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

7. chondroplasty
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

8. arthrocentesis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

9. synovectomy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

10. ostectomy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

Medications and Drug Therapies

Term	Pronunciation	Meaning
analgesic	an'ăl-jē'zik	a drug that relieves pain without producing anesthesia
corticosteroid	kōr'ti-kō-ster'oyd	a drug that reduces inflammation around joints
nonsteroidal anti-inflammatory drug (NSAID)	non'ster-oy'dăl an'tī-in-flam'ă-tōr-ē drŭg	drug with anti-inflammatory action (and usually analgesic and antipyretic effects as well); used to treat joint and muscle conditions
skeletal muscle relaxant	skel'ĕ-tăl mŭs'ĕl rē-lak'sănt	a drug that relaxes skeletal muscle spasms and spasticity

Exercise: Medications and Drug Therapies

Exercise 23

Write the correct medication or drug therapy term for the definition given.

1. relaxes skeletal muscles _____

2. relieves pain without anesthesia _____

3. reduces inflammation around joints _____

4. reduces inflammation without the use of steroids _____

Specialties and Specialists

Term	Pronunciation	Meaning
chiropractic	kī′rō-prak′tik	health care discipline involving physical manipulation of musculoskeletal structures
chiropractor	kī′rō-prak′tŏr	one who specializes in chiropractic
orthopedics, orthopaedics	ōr′thō-pē′diks	medical specialty focusing on diagnosis and treatment of disorders of the musculoskeletal system
orthopedist, orthopaedist	ōr′thō-pē′dist	physician who specializes in orthopedics
orthotics	ōr-thot′iks	the science of making and fitting orthopedic devices
orthotist	ōr-thŏt′ist	one who makes and fits orthopedic appliances
osteopathy	os′tē-op′ă-thē	school of medicine emphasizing manipulative measures in addition to techniques of conventional medicine
osteopath	os′tē-ō-path	physician who specializes in osteopathy
podiatry	pō-dī′ă-trē	medical specialty focusing on diagnosis and treatment of disorders of the foot
podiatrist	pō-dī′ă-trist	physician who specializes in podiatry
rheumatology	rū′mă-tol′ŏ-jē	medical specialty focusing on the study, diagnosis, and treatment of joint conditions
rheumatologist	rū′mă-tol′ŏ-jist	physician who specializes in rheumatology

Exercise: Specialties and Specialists

Exercise 24

Match each medical specialist with the description of the specialty.

podiatrist
rheumatologist
chiropractor
osteopath
orthopedist
orthotist

Description	Term
1. physical manipulation of musculoskeletal structures	_____
2. diagnosis and treatment of foot disorders	_____
3. making and fitting orthopedic devices	_____
4. school of medicine emphasizing manipulative measures	_____
5. diagnosis and treatment of joint conditions	_____
6. diagnosis and treatment of disorders of the musculoskeletal system	_____

Abbreviations

Abbreviation	Meaning
C1 to C7	cervical vertebrae 1 to 7
CK	creatine kinase
CT	computed tomography
CTS	carpal tunnel syndrome
EMG	electromyogram
ESR	erythrocyte sedimentation rate
fx	fracture
L1 to L5	lumbar vertebrae 1 to 5
MD	muscular dystrophy
MG	myasthenia gravis
MRI	magnetic resonance imaging
NSAID	nonsteroidal anti-inflammatory drug
OA	osteoarthritis
ORIF	open reduction, internal fixation
RA	rheumatoid arthritis
RF	rheumatoid factor
ROM	range of motion
T1 to T12	thoracic vertebrae 1 to 12

Exercises: Abbreviations

Exercise 25

Write the definition of each abbreviation used in these sentences.

1. Mr. de la Cruz had an **MRI** to assist with the diagnosis of a herniated intervertebral disk.

_____

2. Because of her **MG**, Ms. Hart frequently felt fatigued after walking even a short distance.

_____

3. After her car accident, Mrs. Stegner was found on radiography to have a fracture of **C2**.

_____

4. **MD** is a hereditary degenerative disease.

_____

5. Because of pain resulting from severe osteoarthritis, Mr. Springer has limited **ROM** in his shoulder.

_____

6. An **ORIF** was performed to repair Mr. Harrell's fracture of the femur.

_____

7. An **EMG** was obtained to help diagnose the nerve damage in Mr. Dura's arm.

_____

8. Ms. Dhalaya told her orthopedist that she was sure her **CTS** resulted from all the typing she did at work.

_____

9. Mr. Murphy's medical record indicated **RA** diagnosed at age 55.

_____

10. Mrs. Helmsley's physician wanted her to try a **NSAID** for her arthritis before prescribing a different drug.

_____

11. To test for musculoskeletal problems, Mr. Kapur was scheduled for the following lab tests: **ESR**, **RF,** and **CK**.

_____

Exercise 26

Match each abbreviation with the appropriate description.

CT	OA	T4
L3	fx	MRI

1. fourth thoracic vertebra _____
2. injury of osseous tissue _____
3. radiographic cross-section _____
4. located well below the ribs _____
5. imaging of magnetic effects _____
6. involving articular cartilage _____

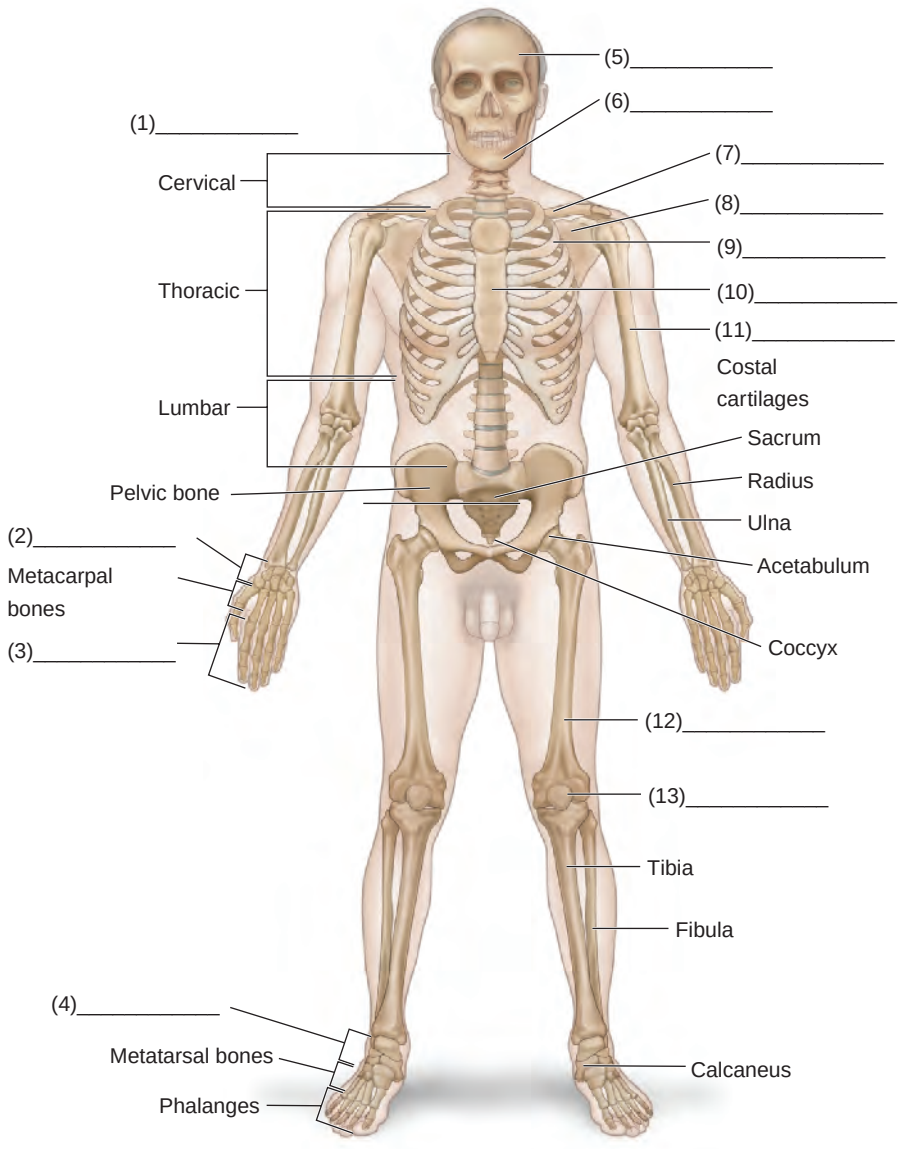
Chapter Review

Review of Terms for Anatomy and Physiology

Exercise 27

VISUAL

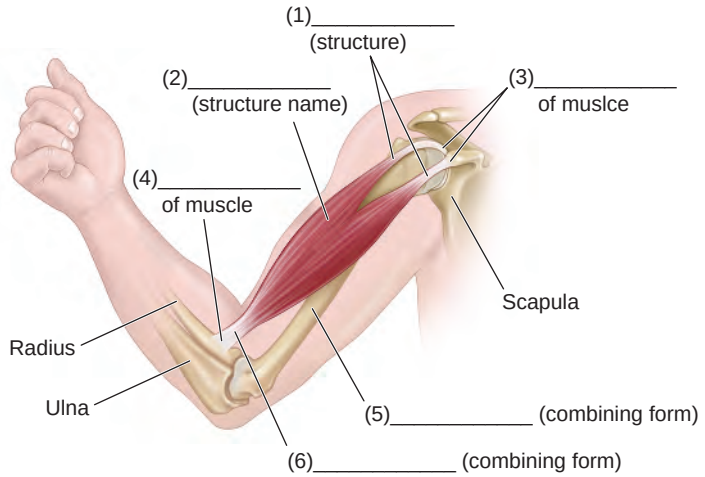
Write the appropriate combining forms on the blanks for the bones indicated.



VISUAL

Exercise 28

Fill in the blanks as appropriate for the structures illustrated.



Understanding Term Structure

TERM CONSTRUCTION

Exercise 29

Break the given medical term into its word parts and define each part. Then define the medical term. (Note: you may need to use word parts from other chapters.)

For example:

arthritis — *word parts:* arthr/o / -itis
meanings: joint / inflammation
term meaning: inflammation of a joint

1. ankylosis — *word parts:* _____ / _____
meanings: _____ / _____
term meaning: _____

2. carpoptosis — *word parts:* _____ / _____
meanings: _____ / _____
term meaning: _____

3. electromyogram — *word parts:* _____ / _____ / _____
meanings: _____ / _____ / _____
term meaning: _____

4. myositis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

5. kyphosis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

6. intracranial
word parts: _____ / _____ / _____
meanings: _____ / _____ / _____
term meaning: _____

7. polymyositis
word parts: _____ / _____ / _____
meanings: _____ / _____ / _____
term meaning: _____

8. suprapatellar
word parts: _____ / _____ / _____
meanings: _____ / _____ / _____
term meaning: _____

9. tenodynia
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

10. arthrocentesis
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

11. chondrectomy
word parts: _____ / _____
meanings: _____ / _____
term meaning: _____

12. costovertebral
word parts: _____ / _____ / _____
meanings: _____ / _____ / _____
term meaning: _____

13. submandibular *word parts:* _____ / _____ / _____

meanings: _____ / _____ / _____

term meaning: _____

14. osteoarthritis *word parts:* _____ / _____ / _____

meanings: _____ / _____ / _____

term meaning: _____

15. myorrhaphy *word parts:* _____ / _____

meanings: _____ / _____

term meaning: _____

16. osteomalacia *word parts:* _____ / _____

meanings: _____ / _____

term meaning: _____

17. arthroscopy *word parts:* _____ / _____

meanings: _____ / _____

term meaning: _____

18. myalgia *word parts:* _____ / _____

meanings: _____ / _____

term meaning: _____

19. spondylarthritis *word parts:* _____ / _____ / _____

meanings: _____ / _____ / _____

term meaning: _____

Comprehension Exercises

Exercise 30

Fill in the blank with the correct term.

1. Movement of an appendage toward the midline of the body is called _____ .

2. _____ is the science of making and fitting orthopedic devices.

3. The general term for the surgical restoration of joint function or creation of an artificial joint is _____ .

4. A(n) _____ is one who specializes in the diagnosis and treatment of disorders of the foot.

5. An artificial leg is an example of a(n) _____ .

6. _____ is caused by nerve entrapment in the wrist that produces pain.

7. The type of bone tissue that is solid and strong is called _____ bone.

8. The abnormal development or growth of a tissue or organ, often resulting from nutritional deficiency, is called _____ .

9. _____ is a condition of chronic aching and stiffness of muscles and soft tissues of unknown cause.

10. _____ is a direction of movement that increases the joint angle.

11. Nuclear medicine imaging can produce an image of the body's bones, called a(n) _____, to diagnose possible bone disorders.

12. Muscular _____ is a hereditary condition causing progressive degeneration of skeletal muscles.

13. Progressive destructive changes in multiple joints, especially in the hands and feet, may be caused by _____ .

14. The amount of movement allowed in a joint is termed its _____ .

15. Excessive muscular activity is termed _____ .

16. _____ is a nonmedical specialty involving physical manipulation of musculoskeletal structures.

17. _____ is the joint movement that bends the foot upward.

18. The medical specialty focusing on diagnosis and treatment of disorders of the musculoskeletal system is _____ .

COMPREHENSION

Exercise 31

Write a short answer for each question.

1. What kind of joint is a suture? _____

_____

2. A ligament attaches what structures together?_____

3. Where in the body are the metacarpal bones?_____

4. What does it mean to say a tissue is osseous?_____

_____

5. How is the practice of an osteopath different from that of other physicians?_____

_____

6. In what situation might a tenorrhaphy be performed?_____

_____

7. Rickets may result from a deficiency of what?_____

8. Arthrodesis performed during spinal surgery does what to a spinal joint?_____

_____

9. What is deposited in a joint's tissues that causes pain in someone with gout?_____

10. What kind of diagnostic image is produced with arthrography?_____

_____

11. Which end of a muscle is its insertion?_____

_____

12. Where is the xiphoid process located?_____

_____

13. In addition to skeletal and unstriated muscle tissue, what other type of muscle tissue is found in the body? _____

14. What is another term for a laminotomy?_____

COMPREHENSION

Exercise 32

Circle the letter of the best answer in the following questions.

1. The term that most specifically applies to inflammation of an articular cartilage is:

   A. osteitis
   B. chondritis
   C. arthrochondritis
   D. arthritis

2. The clavicle articulates with the:

   A. femur
   B. fibula
   C. ilium
   D. sternum

3. A diarthrosis:

A. moves freely
B. causes pain
C. requires surgery
D. is herniated

4. An exostosis may develop from:

A. bone marrow
B. a sarcoma
C. a herniated disk
D. cartilage

5. Hypertrophy of an organ means it is:

A. abnormally large
B. malignant
C. gouty
D. necrotic

6. Dyskinesia generally refers to difficulty in:

A. hyperextending the wrist
B. embryonic fusing of vertebra
C. obtaining a clear radiographic image
D. performing voluntary movements

7. Even if you had never heard of this condition, you might assume that chondromalacia refers to:

A. hardening of cartilage
B. softening of cartilage
C. hardening of bone
D. softening of bone

8. An example of circumduction is:

A. movement at the shoulder joint when the arm is moved in circles
B. movement at cervical spinal joints when the head is turned right and left
C. movement at the wrist when the hand is turned from palm down to palm up
D. movement at the wrist when the hand is turned from palm up to palm down

9. A patient with ankylosing spondylitis is most likely to feel pain when:

A. typing at a computer keyboard
B. bending down to tie their shoes
C. waving hello to someone at a distance
D. chewing gum

10. A traumatic injury that fractures the patella might also injure which other structure?

A. the humerus
B. a suture
C. the pubis
D. a meniscus

11. Which of the following vertebrae is closest to the sacrum?

A. L5
B. T12
C. T1
D. C7

12. Which kind of tissue is in closest proximity to periosteal tissue?

A. bone
B. muscle
C. ligament
D. bone marrow

13. Tenodynia is most likely to occur with:

A. rickets
B. tarsectomy
C. tenosynovitis
D. bursitis

14. In scoliosis, the spine curves:

A. from side to side
B. from forward to backward in the lumbar area
C. from forward to backward in the cervical area
D. from backward to forward

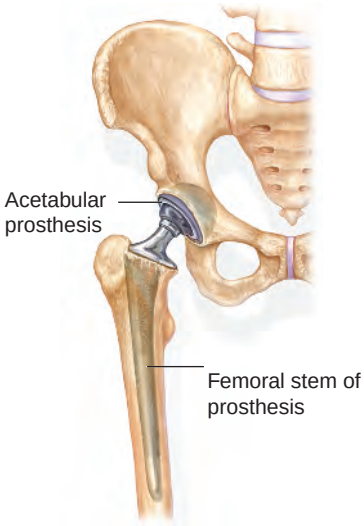
Application and Analysis

CASE REPORTS

Exercise 33

Read the case reports and circle the letter of your answer choice for the questions that follow each case.

CASE 14-1



Because of severe osteoarthritis, Mr. Hughes is undergoing total hip replacement. During this surgery the proximal end of his femur will be resected, and the stem of a metal prosthesis will be inserted in the femur. Damaged bone in the acetabulum will be excised, and a plastic cup-shaped prosthetic piece cemented into the bone. The ball on top of the femoral prosthesis fits within this cup. Together these components will compose his new hip joint (Fig. 14-29).

Figure 14-29 Total hip replacement with the prosthesis in place.

1. The acetabulum is part of what bone?

A. the pelvic bone
B. the femur
C. the coccyx
D. the ilium

2. The new hip is called a prosthesis because it is:

A. a surgical correction
B. inside the body
C. an orthopedic device
D. a fabricated replacement part

3. Resection of the proximal end of the femur means:

A. it is filed down to a smooth surface
B. it is surgically removed
C. a new osseous section will be transplanted there
D. surgical reconstruction

4. The stem of the femoral prosthesis will extend down into:

A. the pubis
B. the patella
C. the femur's medullary cavity
D. the epiphysis of the tibia

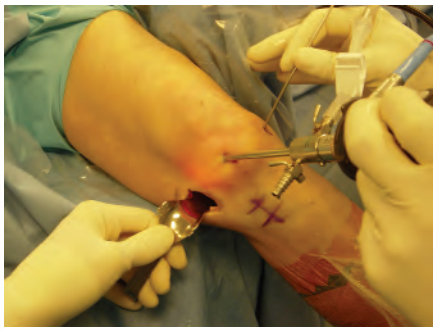
5. In Mr. Hughes' new hip, the metallic femoral ball will articulate with:

A. the ischium
B. the acetabular prosthesis
C. the femoral periosteum
D. cancellous bone

6. This total hip replacement is an example of a(n):

A. chondroplasty
B. diskectomy
C. arthroplasty
D. arthroclasia

CASE 14-2



Mr. Bhatnagar suffered a tear of his anterior cruciate ligament (ACL) during a football game, causing significant pain and instability of the joint. The diagnosis was made with x-rays, MRI scans, and a stress test of the ligament. Arthroscopic reconstructive surgery of the knee joint is to be performed. The ACL will be reconstructed using a harvested section of the central third of the patellar tendon in a graft. The entire procedure will be performed arthroscopically (Fig. 14-30).

Figure 14-30 Arthroscopic knee surgery.

7. The ACL joins:

A. muscle to muscle
B. muscle to bone
C. bone to muscle
D. bone to bone

8. An arthroscope is an instrument that:

A. allows viewing inside a joint
B. forms an image based on tissue effects of magnetism
C. is used to create radiographic images
D. involves administration of radionuclides

9. Which suffix most likely is used in the term for the procedure for creating an opening into the knee joint?

A. -physis
B. -desis
C. -clasia
D. -tomy

10. The patellar tendon harvested for use in the graft normally joins:

A. muscle to muscle
B. muscle to bone
C. bone to ligament
D. bone to bone

11. If the grafted tendon section is sutured to a section of the torn ligament, which suffix is most likely used in the term for that procedure?

A. -rrhaphy
B. -physis
C. -ectomy
D. -centesis

MEDICAL RECORD ANALYSIS

MEDICAL RECORD 14-1

Physical therapy assistant working with a patient.

You are a physical therapy assistant working in a physical therapy clinic. It is your job to help assess patients and develop individualized treatment programs under the guidance of the physical therapist. Ms. Jackson was referred to your clinic by her primary physician because of a history of chronic back pain. You review this medical record from her physician so you may assist in her care.

Medical Record

LOW BACK PAIN

SUBJECTIVE: The patient came to my office with chief complaints of chronic back pain radiating down to the right more than left buttock and the thigh area. This pain increases with walking, standing, and rotating the back. She is taking Ambien and etodolac at this time. She is a known hypertensive with low back pain and left foot pain. She denies any new family or social history. She was on Vioxx and stopped when changed to etodolac. On review of systems, she reports some weight loss. She denies any heart pain, skin problems, eye problems, ear problems, hearing problems, swallowing problems, abdominal problems, diarrhea, constipation, or bowel/bladder incontinence.

OBJECTIVE: On examination the patient is a moderately built, well-nourished female. She appears to be comfortable. Her blood pressure is 136/69, heart rate 63, temperature 98.6. Her current weight is 200 pounds. She is awake, alert, and oriented. Pupils are equal and reacting. Sclerae are anicteric. Oropharynx is clear. The neck is supple. Carotid pulses are felt well. Trachea is midline. Breath sounds are heard. The abdomen is soft. The breath sounds are easily heard. The heart has a regular rate and rhythm. Upper extremity sensation reveals motor power within normal limits. The back has an old surgical scar. There is severe myofascial tenderness noted, paraspinal region in the lower lumbar and upper sacral area. Lower extremities are symmetrical. There is mild edema noted, more so in the ankles. There is decreased range of motion in the hips secondary to pain. Sensation is intact to light touch. Gait is slow and stable. She walks with a single-point cane. Sensation is intact.

ASSESSMENT: This is a patient with chronic low back pain, bilateral total knee replacement, and a prior low back surgery. She continues to have pain.

PLAN: The previous injection significantly helped the patient with her pain for about 3 months. I will consider her for a repeat L5-S1 foraminal block under fluoroscopy in the next 2 to 3 weeks. I have advised the patient to continue the current medications and have ordered a physical therapy consultation.

APPLICATION

Exercise 34

Write the appropriate medical terms used in this medical record on the blanks after their definitions. Note that not all the terms appear in the chapter, but you should be able to identify these terms based on word parts that are included in this chapter.

1. pertaining to area beside or around the spine _____
2. pertaining to fused vertebrae below lumbar vertebrae _____
3. pertaining to muscle and fascia _____
4. amount of movement in a joint _____

Bonus Question

5. Where has this patient had arthroplasty in the past?

_____

MEDICAL RECORD 14-2

Mrs. Formosa, a patient who suffers from rheumatoid arthritis, has returned to the physician's office where you work as a phlebotomist. You are responsible for drawing blood samples from Mrs. Formosa to be used for the CBC and sedimentation rate tests ordered by the physician.

Medical Record

RHEUMATOID ARTHRITIS FOLLOW-UP NOTE

HISTORY OF PRESENT ILLNESS: The patient is a 38-year-old woman who has an illness of about 3 to 4 years, characterized by myalgias, (1)_____, and arthritis located in the MCP joints, PIP joints, wrists, and ankles. In addition, the patient has had intermittent Raynaud, mild hair loss, and a transient rash located on the face and the neck. Other problems are sleep abnormalities and problems with equilibrium that are under evaluation by neurology. In our initial evaluation, we considered that the patient may have an undifferentiated connective tissue disease, and the possibilities were rheumatoid arthritis, lupus, or scleroderma. A trial of prednisone 15 mg was initiated. Two days after the patient started taking prednisone, she felt an impressive improvement that she describes as a miracle. The chronic sensation of fatigue was almost eliminated, and the (2)_____ is very mild, as well as the arthritis. The patient has not had episodes of (3)_____ since. The patient has been unusually active at work with energy and is able to do gardening. There is no significant change in morning stiffness, and this is still about 30 minutes in duration.

PERTINENT PHYSICAL FINDINGS: The general examination is benign. There is no hair loss. There is very mild erythema on the neck with fine telangiectasis that was mentioned before. There are no other skin lesions, and there are no mucosal lesions either. Musculoskeletal examination shows a motor power of 5/5 in all four extremities, (4)_____ is normal in all joints, and there is no evidence of synovitis at any level.

X-rays of hands show only mild osteopenia around the MCP and PIP joints. There are no erosions.

ASSESSMENT/PLAN: The patient is a 38-year-old woman with an undifferentiated inflammatory polyarthritis. Considering the family history of a father and a brother with rheumatoid arthritis, it is possible that the patient is at the stage of an early (5)_____, which is seronegative. Given the presence of Raynaud and fine telangiectasis, we have to keep in mind the possibility of this illness evolving to scleroderma. We do not have serologic evidence of lupus, and there is no biochemical evidence of myositis. Our plan at the moment will be to initiate high-dose chloroquine at 400 mg once daily, evaluation by an ophthalmologist, and a slow reduction of prednisone to 10 mg in 1 month and then 1 mg per week. We are scheduling an appointment in 2 months and requesting a CBC and sedimentation rate for the next visit.

APPLICATION

Exercise 35

Fill in the blanks in the medical record above with the correct medical terms. The definitions of the missing terms are listed below.

1. joint pain
2. muscle pain

3. joint inflammation

4. amount of movement in a joint

5. disease causing progressive destructive changes in multiple joints

Bonus Question

6. Although this chapter does not define the term "polyarthritis" used in the Assessment/Plan section of the record, you should be able to define it from its word parts:

_____

Pronunciation and Spelling


AUDITORY

Exercise 36

Review the Chapter 14 terms in the Dictionary/Audio Glossary in the Student Resources and practice pronouncing each term, referring to the pronunciation guide as needed.

SPELLING

Exercise 37

Circle the correct spelling of each term.

1.	laminetomy	laminotomy	lamanotomy
2.	ostoarthritis	ostioarthritis	osteoarthritis
3.	rheumatology	rhuematology	rheumetology
4.	tenodyne	tenodyna	tenodynia
5.	osseis	osseous	oseous
6.	clavicle	clavicel	clavecle
7.	myorhaphy	myorrhapphy	myorrhaphy
8.	vertebrea	vertebrae	vertabrae
9.	fibromyalgia	fibrilmyalgia	fibromyolgia
10.	dorseflexion	dorsaflexion	dorsiflexion
11.	ankelosis	ankylosis	ankylesis
12.	polimyositis	polymyositis	polymiositis

13.	faisca	fasckia	fascia
14.	osteoporosis	ostioporosis	osteoporesis
15.	intervertebrel	intervertabral	intervertebral

Media Connection


STUDENT RESOURCES

Exercise 38

Complete each of the following activities available with the Student Resources. Check off each activity as you complete it, and record your score for the Chapter Quiz in the space provided.

Chapter Exercises

____  Flash Cards

____  Concentration

____  Abbreviation Match-Up

____  Roboterms

____  Word Builder

____  Fill the Gap

____  Break It Down

____  True/False Body Building

____  Quiz Show

____  Complete the Case

____  Medical Record Review

____  Look and Label

____  Image Matching

____  Spelling Bee

____ **Chapter Quiz** *Score:* _____%

Additional Resources

____  Video: Vertebral Disk

____  Animations: Muscle Flexion and Extension; Bone Growth

____  Dictionary/Audio Glossary

____ Health Professions Careers: Physical Therapy Assistant

____ Health Professions Careers: Phlebotomist