

MUSCULOSKELETAL SYSTEM



BY,
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GENERAL TERMS

- ORTHOPEDICS
- ORTHOPEDISTS
- PODIATRY
- PODIATRIST
- RHEUMATOLOGY
- RHEUMATOLOGIST
- CHIROPRACTIC
- CHIROPRACTOR

- **Orthopedics** is the medical study of the structure of the musculoskeletal system and diseases, deformities, and injuries associated with it- dealing with the correction of deformities of bones or muscles.
- Physicians who specialize in orthopedics are called **orthopedists**.
- A related specialty, **podiatry**, is concerned with the structure of the foot and associated conditions and injuries
- A physician who specializes in conditions and injuries of the foot is called a **podiatrist**.
- **Rheumatology** is concerned with diseases and conditions of the joints.
- A physician who specializes in rheumatology is called a **rheumatologist**.

- **Chiropractic** is a system of healing based on the relationship between bone structure and the function of the nervous system. Chiropractic medicine considers that disease is related to pressure on nerves by spinal misalignment
- A **chiropractor** is a physician who practices chiropractic. A chiropractor does not perform surgery or prescribe drugs
- **Physiatrists** are medical doctors whose focus is on rehabilitation after injury or illness to muscles, bones, and nerves.
- A **physical therapist** is a master's or doctoral degree-prepared health care professional who develops a treatment plan based on a physician's diagnosis. The goals of physical therapy (PT) are to restore function, improve mobility, and relieve pain.

THE STRUCTURE AND FUNCTIONS OF THE MUSCULOSKELETAL SYSTEM

- **206 BONES**
- provide support for body tissues and serve as a place of attachment for muscles, which allow body movement
- The skeleton also provides protection for internal organs such as the brain, heart, and lungs.
- **Skeleton can be divided into two parts**
 - » axial skeleton
 - » appendicular skeleton

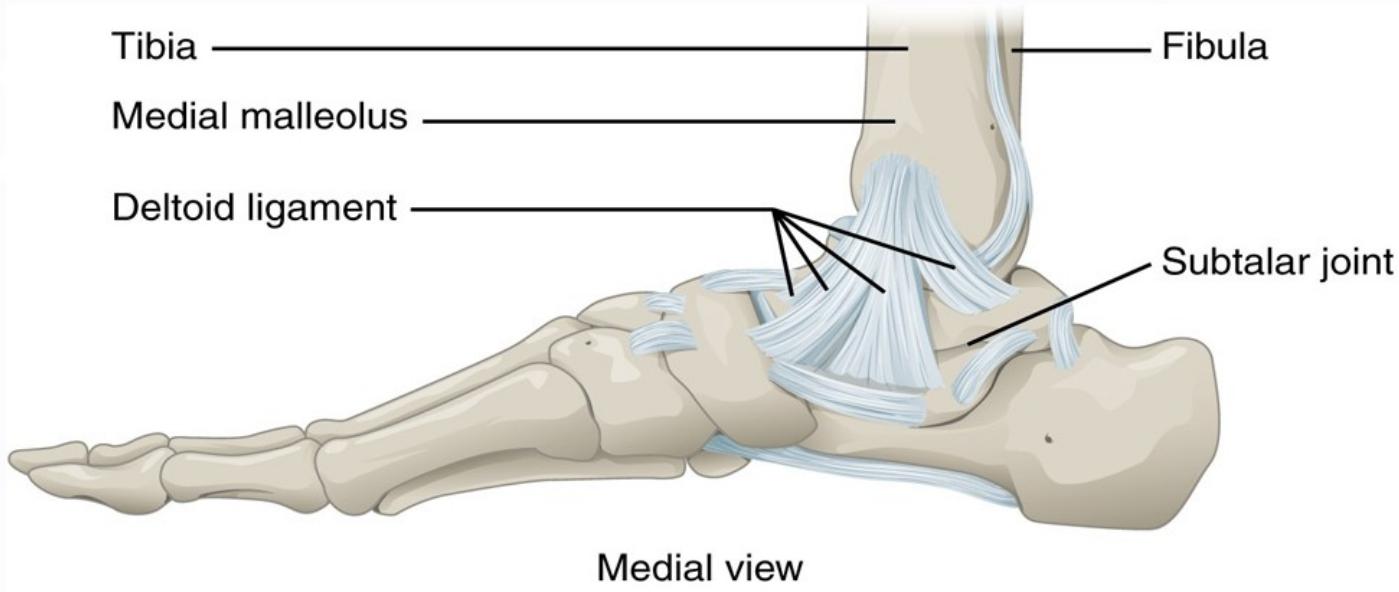
- **The axial skeleton consists of the bones of the skull, thorax, and vertebral column.** These bones outline body cavities and protect the organs they contain.
- **The appendicular skeleton consists of those bones that are appendages of the axial skeleton, including the bones of the hips, arms, and legs**

Connective Tissue

- The protective and supportive structures of the body consist of connective tissue, including bone, cartilage, tendons, and ligaments.
- Bone is comprised of fibrous and ground substances and, by weight, is about 75% inorganic and 25% organic material. The inorganic portion contains calcium phosphate along with other substances including carbonate, citrate sodium, and magnesium.
- also serve as a storehouse for minerals.

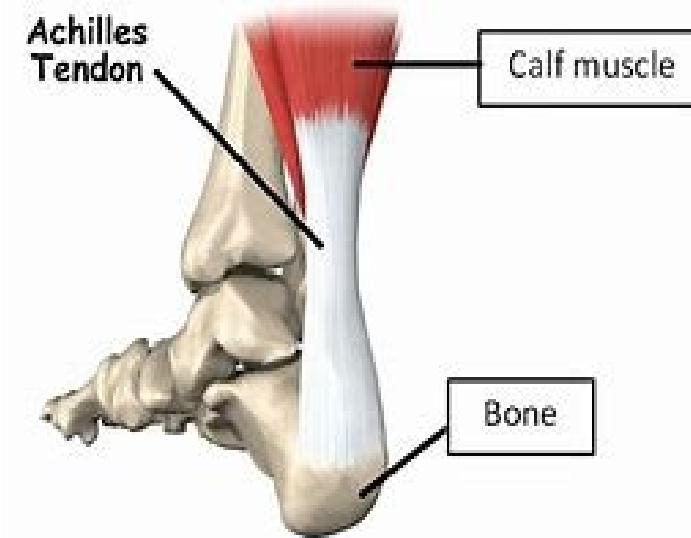
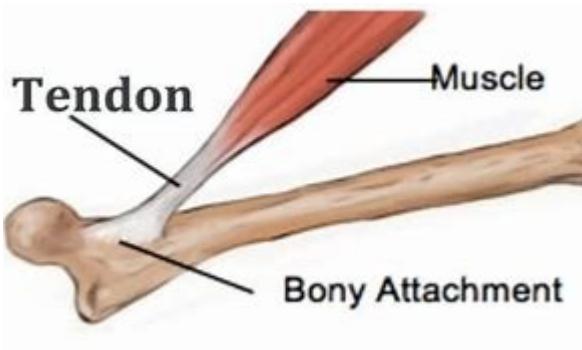
Type of Connective Tissues	Purpose
bone	Provides support and protection to the rest of the body. Stores minerals. Houses marrow that produces blood cells by way of a process called hemopoiesis.
cartilage	Provides a firm yet flexible framework for structures such as the external ears and the lower two thirds of the nose. Provides a lining and cushion for certain joints. Connects certain bones.
ligament	Attaches bone to bone.
muscle	Allows for body movement.
tendon	Attaches muscle to bone.

EG., OF LIGAMENT



MEDIAL ANKLE LIGAMENTS

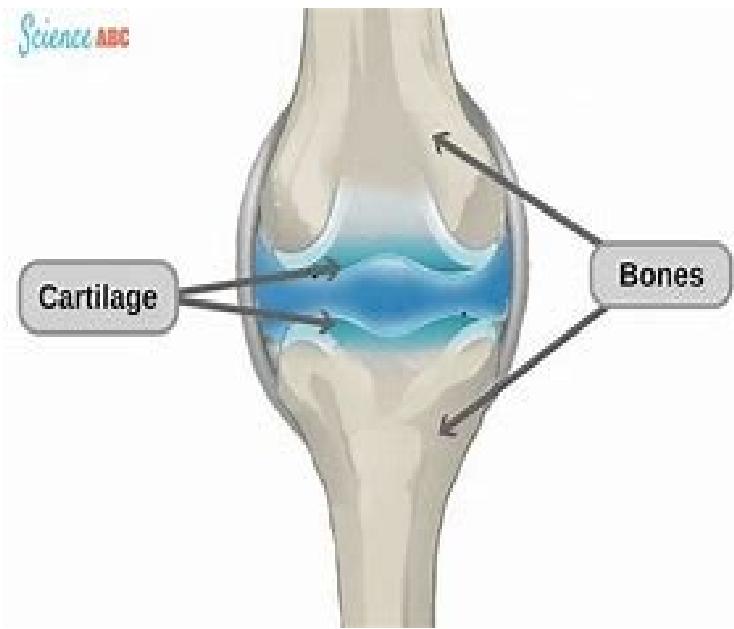
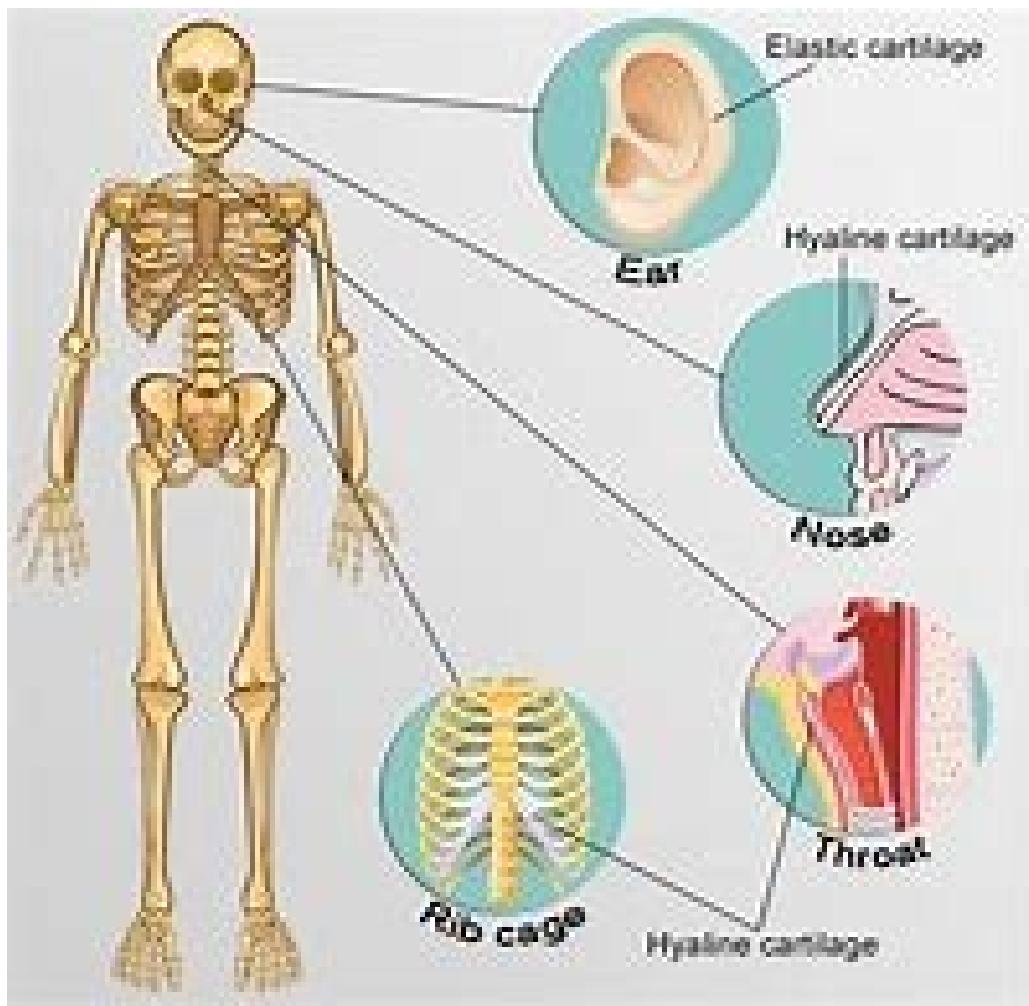
TENDON

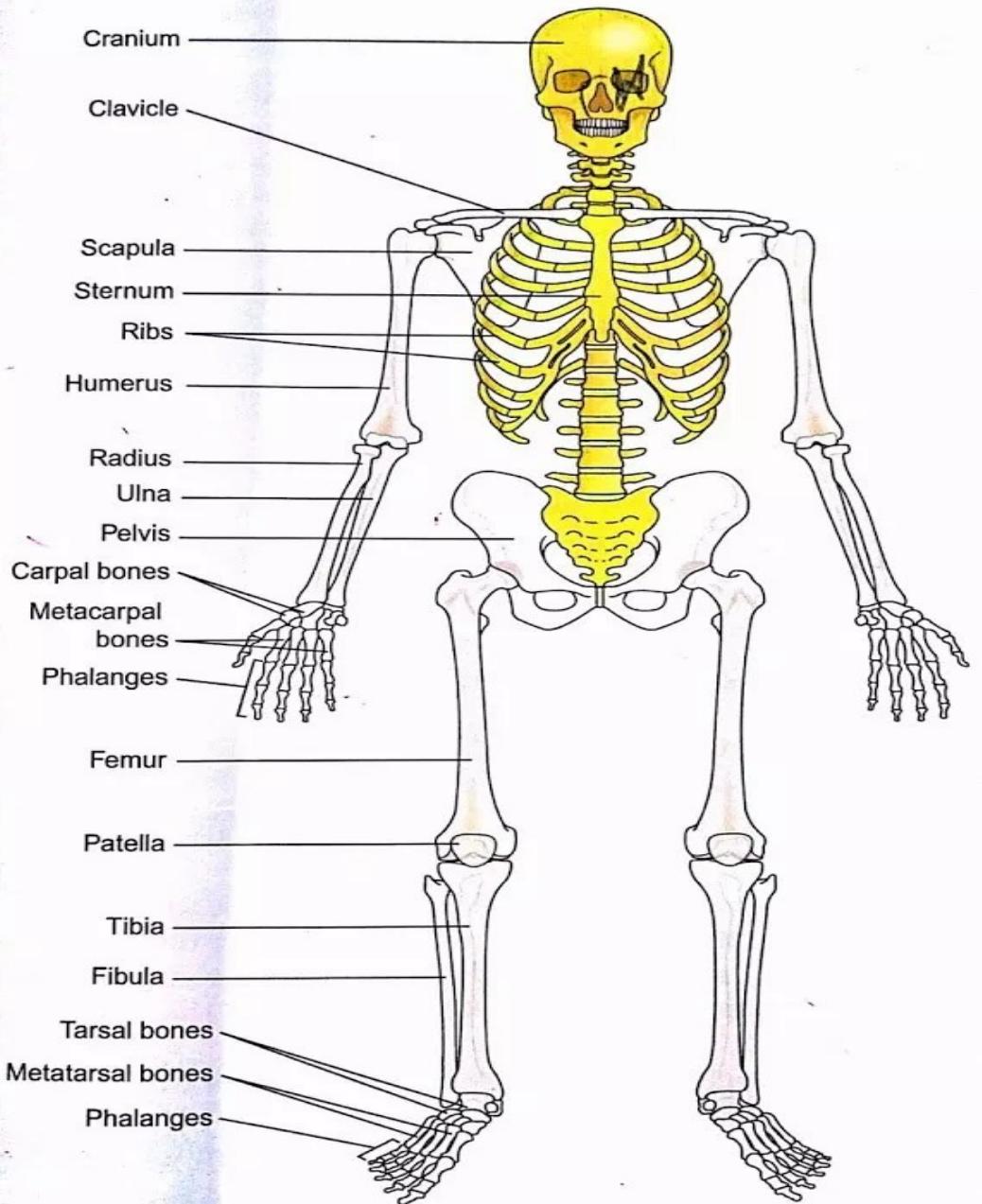


Tendons and ligaments are comprised of fibrous bands of extremely strong connective tissue.

CARTILAGE

- A second type of connective tissue is cartilage, which is more flexible than bone but still fairly rigid. It provides firm but flexible support for structures such as the external ears, nose, and trachea
- Where bones come together to create joints, the bone is covered with cartilage to cushion the bones from jarring and to provide a smooth surface for joint movement
- Bones, cartilage, ligaments, and tendons all contain collagen, an extremely strong protein. The large amount of collagen in ligaments and tendons is what makes these structures tough and rope like





HUMAN SKELETON

Bones

- There are major types of bones:
 - long bones
 - short bones
 - flat bones
 - irregular bones
 - Sesmoid bones
- **Long bones** are found in the **thigh, lower leg, and upper and lower arm.**
- **Short bones** are found in the **wrist ,ankle, toes.**
- **Flat bones** are found covering soft body parts. These bones are the **skull, shoulder blades, ribs, and pelvic bones.**

- **irregular bones**, is a mixture of various complex-shaped bones. These bones tend to be small and include the **bones of the middle ear (malleus, incus, and stapes)** and the **vertebrae**.
- **Sesamoid bones** are small, rounded bones (resembling a sesame seed in shape). They are found near joints, and they increase the efficiency of muscles near a particular joint. The **kneecap** is the largest example of a sesamoid bone.

Types of bones

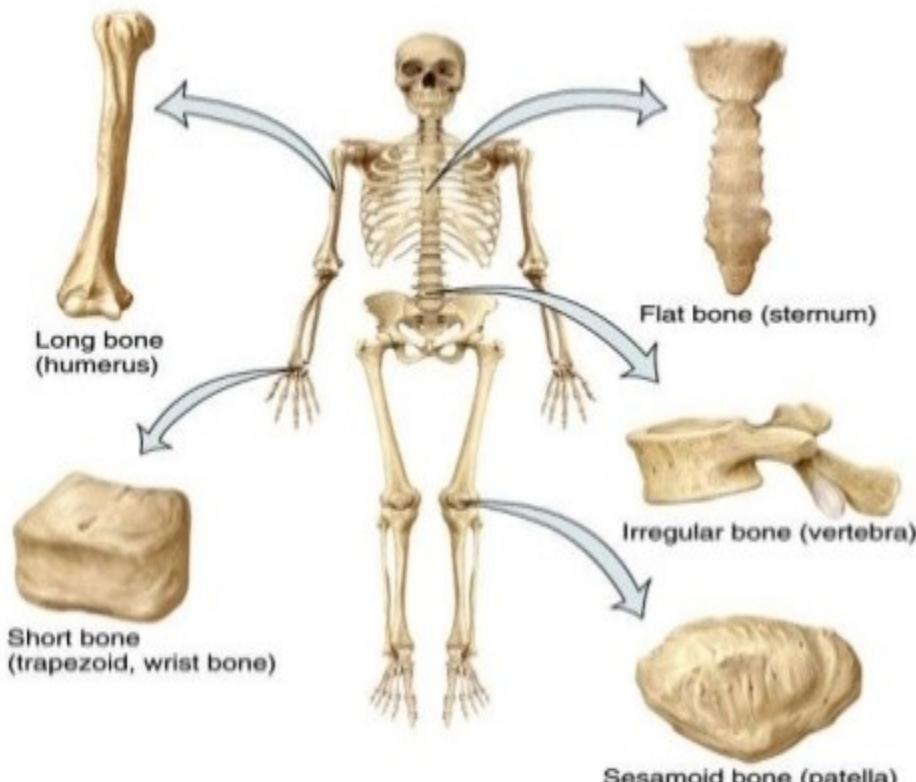
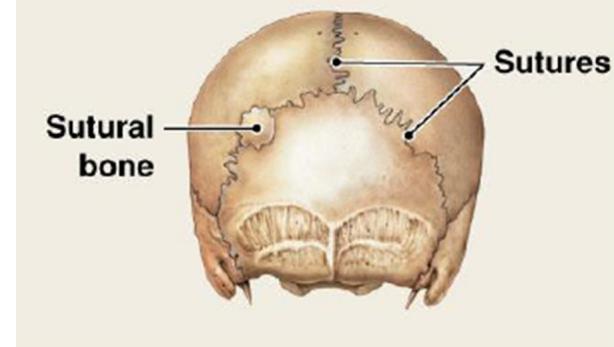


Figure 06.01 Tortora - PHA 11/e
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a Sutural Bones



Structure of a long bone

- The long central shaft is called the **diaphysis** and is comprised of strong, dense **compact bone (CORTICAL BONE)**designed to provide support for the body.
- At each end is an **epiphysis**, which has a bulbous shape to allow for attachment of muscles and ligaments.
- Epiphyses are comprised of **cancellous (spongy) bone**
- A layer of **articular cartilage** covers each epiphysis, providing a cushion to protect joints from being jarred.

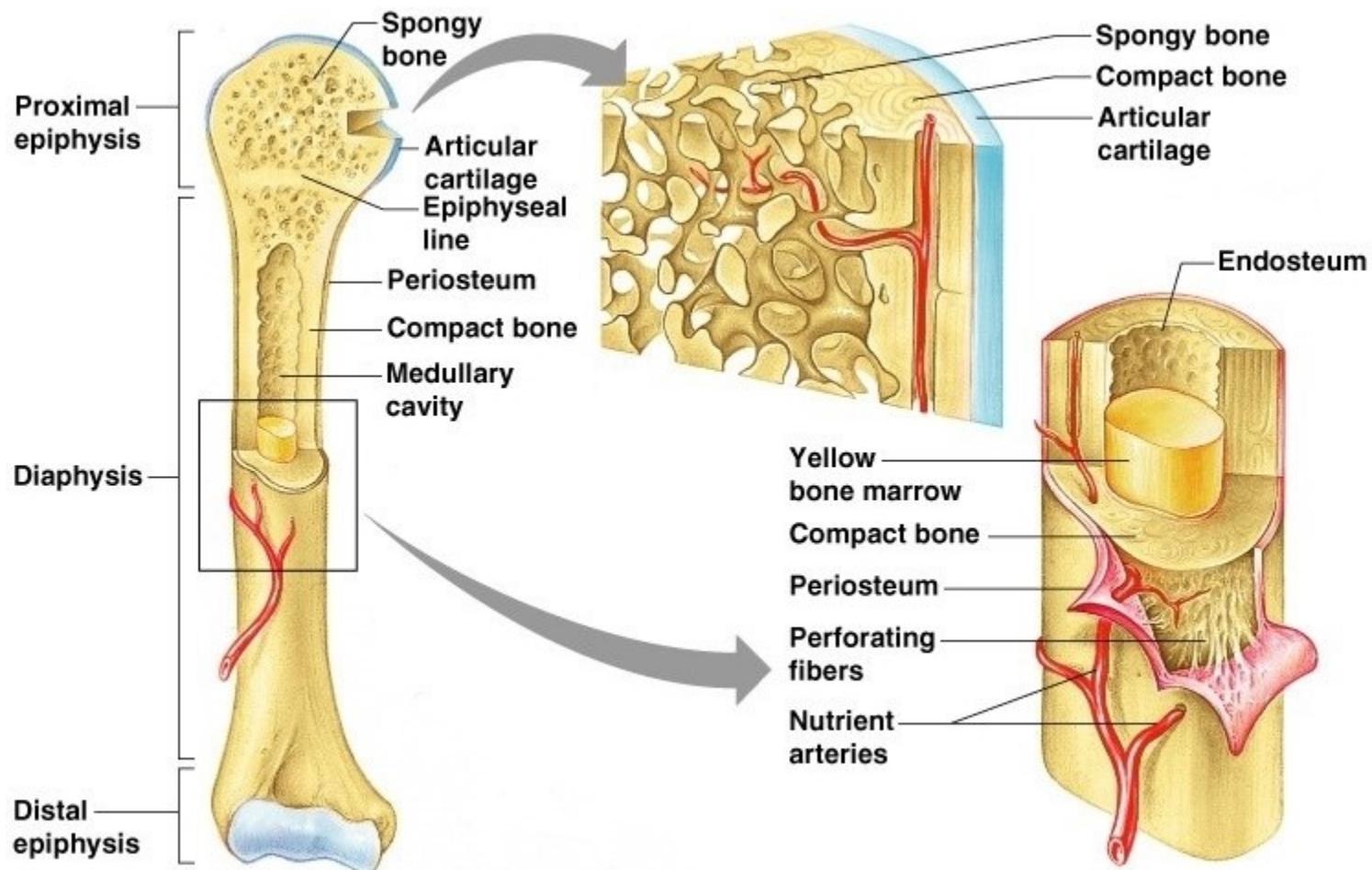
- Those parts of the bone that are not covered by the articular cartilage are covered by the **periosteum**, a dense layer of connective tissue that contains nerves, blood vessels, and lymph vessels.
- At the center of all bones is a cavity filled with a gritty gelatinous substance called **marrow**.
- In the diaphyses of long bones, this area is called the **medullary cavity**.
- The surface of the medullary cavity is lined with a thin layer of connective tissue called the **endosteum**.

BONE MARROW

- There are two types of marrow:
- yellow marrow, which is composed mostly of fat; and
- red marrow, which is where blood cells are produced by a process called **hemopoiesis**.
Most hematopoiesis takes place in the diaphyses of long bones
- Spaces in cancellous bone contain red bone marrow.

- Both the periosteum and endosteum contain **osteoblasts**, special bone-forming cells. These cells cause bones to grow and repair themselves.
- A long bone that is still growing has a **growth plate, or epiphyseal plate**, between each epiphysis and the diaphysis.
- This plate is comprised of cartilage. When bone growth is complete, the cartilage is replaced with bone.

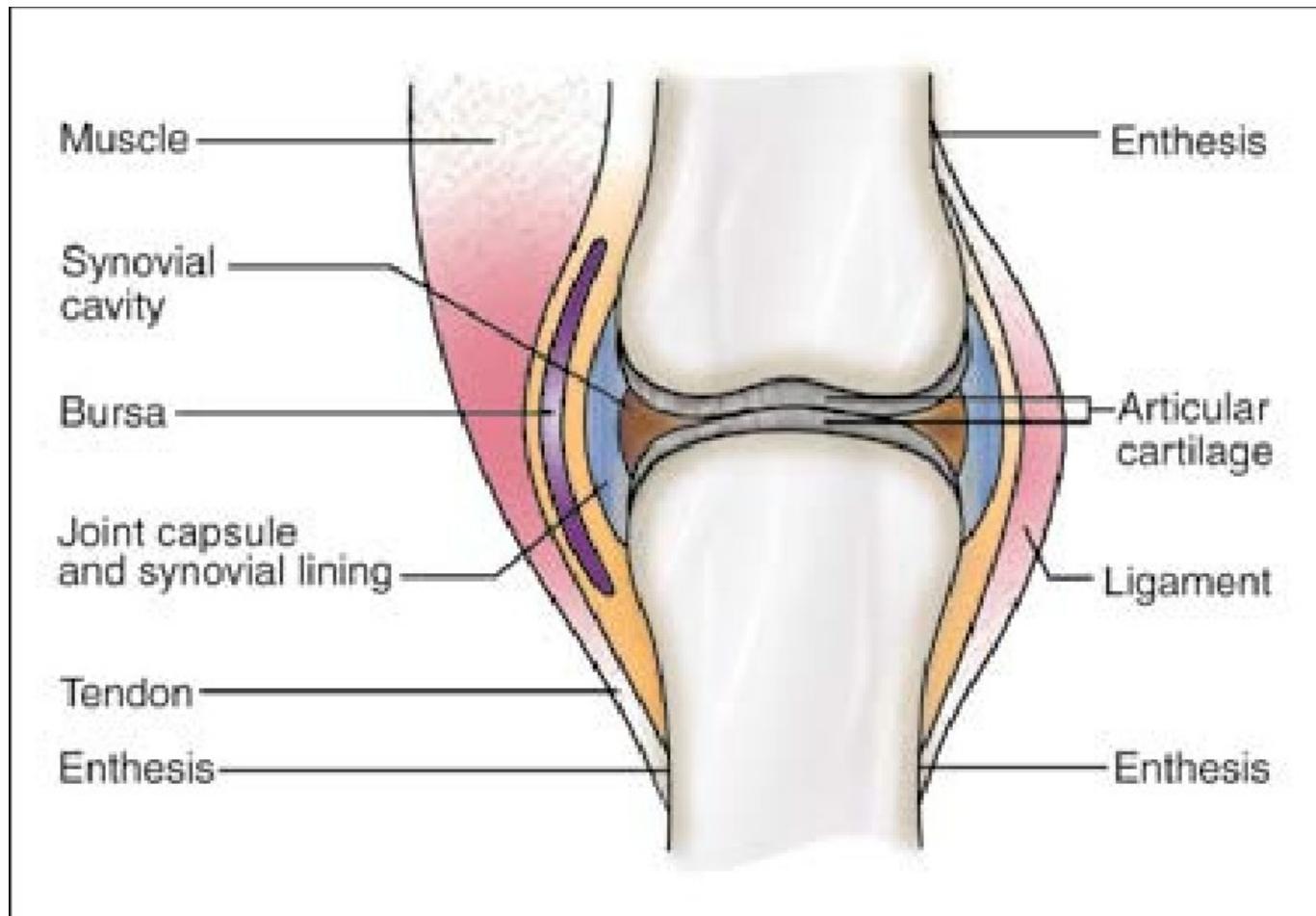
- **SHORT bones** are about as wide as they are long, and their core is comprised of **cancellous bone (SPONGY)** that is surrounded by a layer of compact tissue.



Joints

- **Joints, or articulations,** occur at the union of two bones.
- joints are divided into three categories (structural)
- **Synovial joints**
- **Cartilaginous joints**
- **Fibrous joints**
- **Synovial joints :** move freely because the bones are held together loosely and are separated by a **synovial cavity**.
- This cavity is filled with **synovial fluid** that lubricates joint movement and acts as a cushion between the bones.
- To facilitate smooth movement, synovial fluid-filled sacs called **bursae**

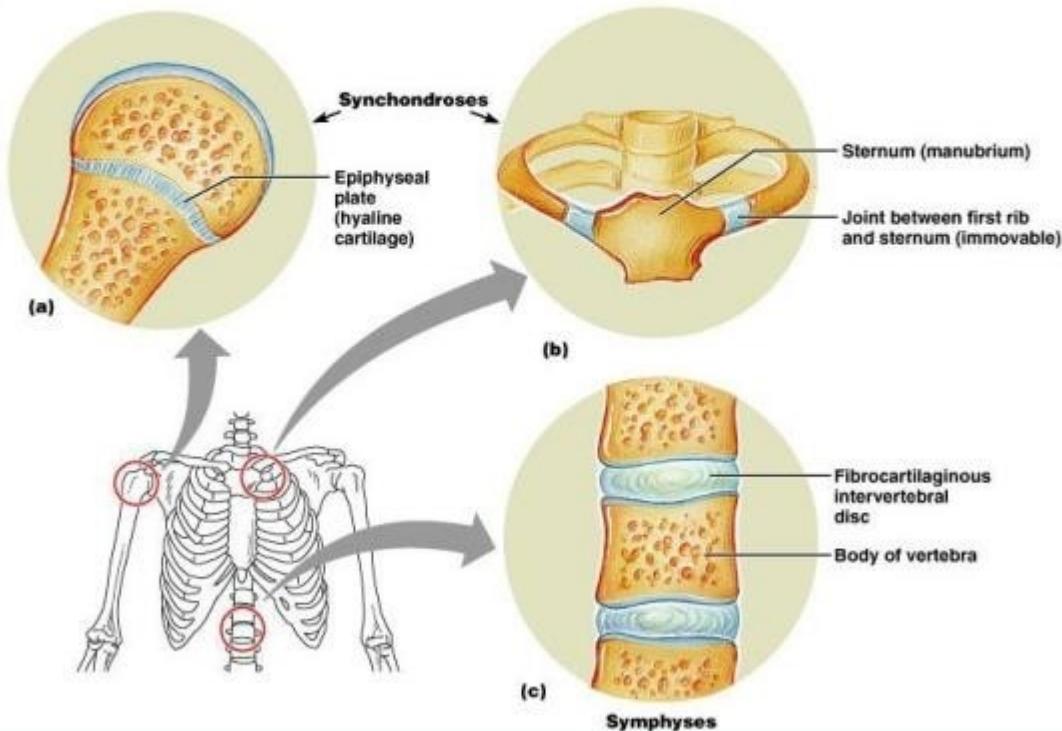
SYNOVIAL CAVITY & BURSA



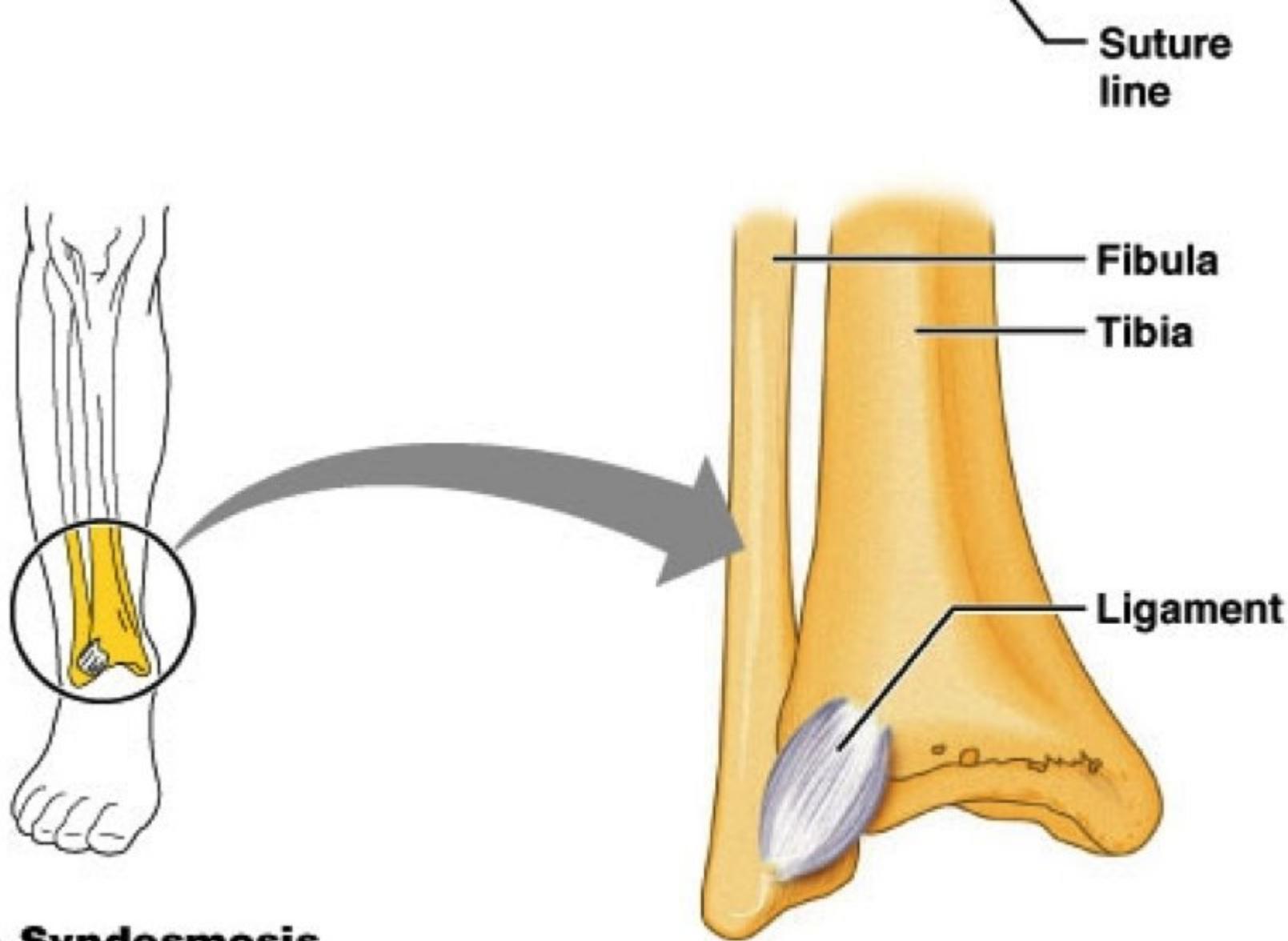
- **What are the different types of Synovial Joint?**
- Synovial joints are further classified into six different categories based on the shape and structure:
 - Planar joints (Gliding)**
 - Hinge joints**
 - Pivot joints**
 - Condyloid joints**
 - Saddle joints**
 - Ball-and-socket joints**

- **Cartilaginous joints** allow slight movement.
- The bones that form these joints are held together quite firmly by cartilage and ligaments.
- An example of this joint occurs between **vertebrae**, which are separated by a segment of cartilage called the **intervertebral disk**.
- This disk serves as a cushion to protect the vertebrae from jarring.

Cartilaginous Joints



- **Fibrous joints** are seen between the bones of the skull. Because these bones are joined by layers of fibrous tissue or cartilage, there is little movement between them.



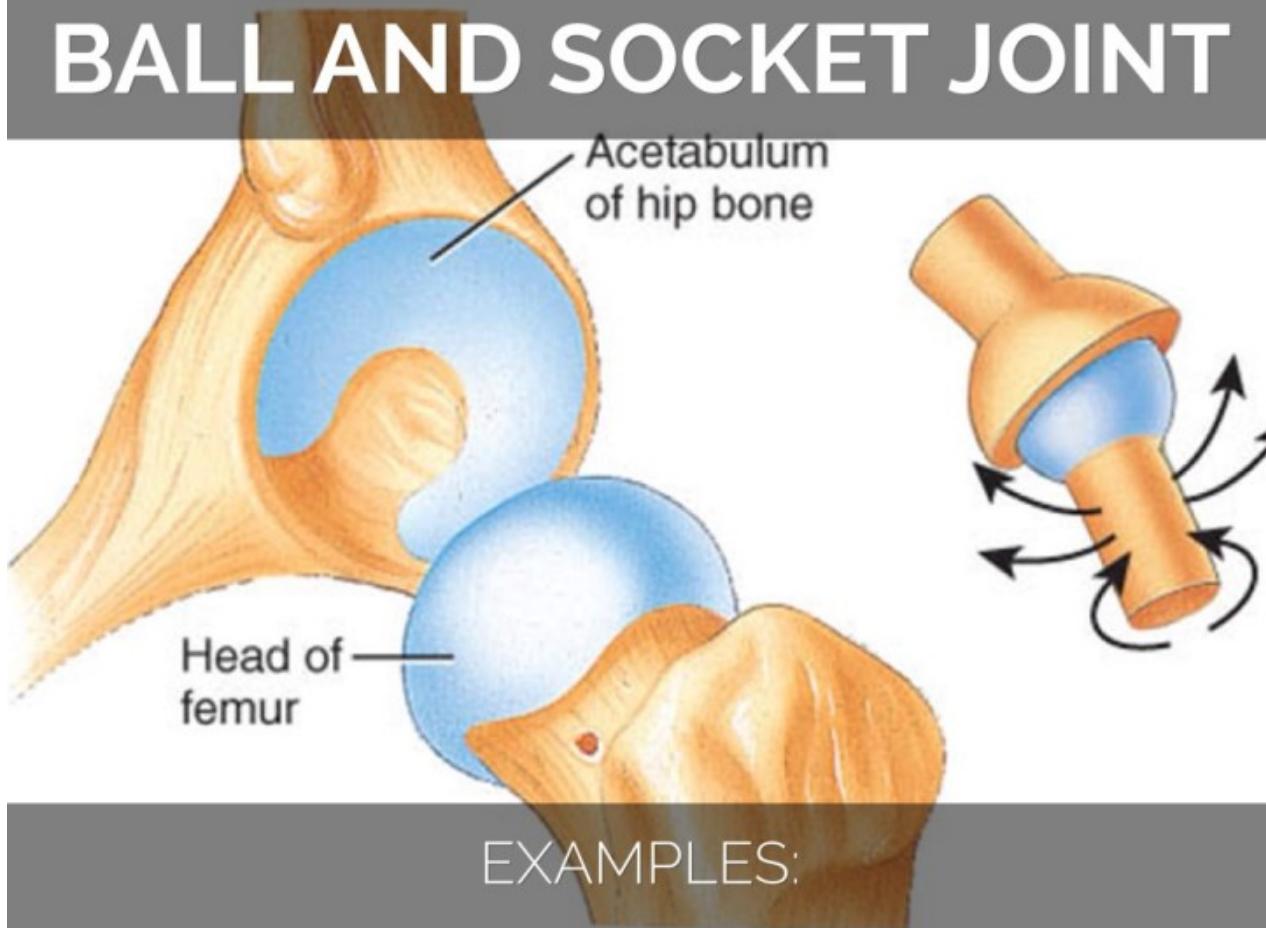
(b) Syndesmosis

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Functional classification of joints

- Functional classification of joints is based on the type and degree of movement permitted.
- There are six types of freely movable joint and are mentioned below with the examples:
- **Ball and Socket Joints**
 - Here, one bone is hooked into the hollow space of another bone. This type of joint helps in rotatory movement. An example ball and socket joint are the shoulders.

BALL AND SOCKET JOINT



EXAMPLES:

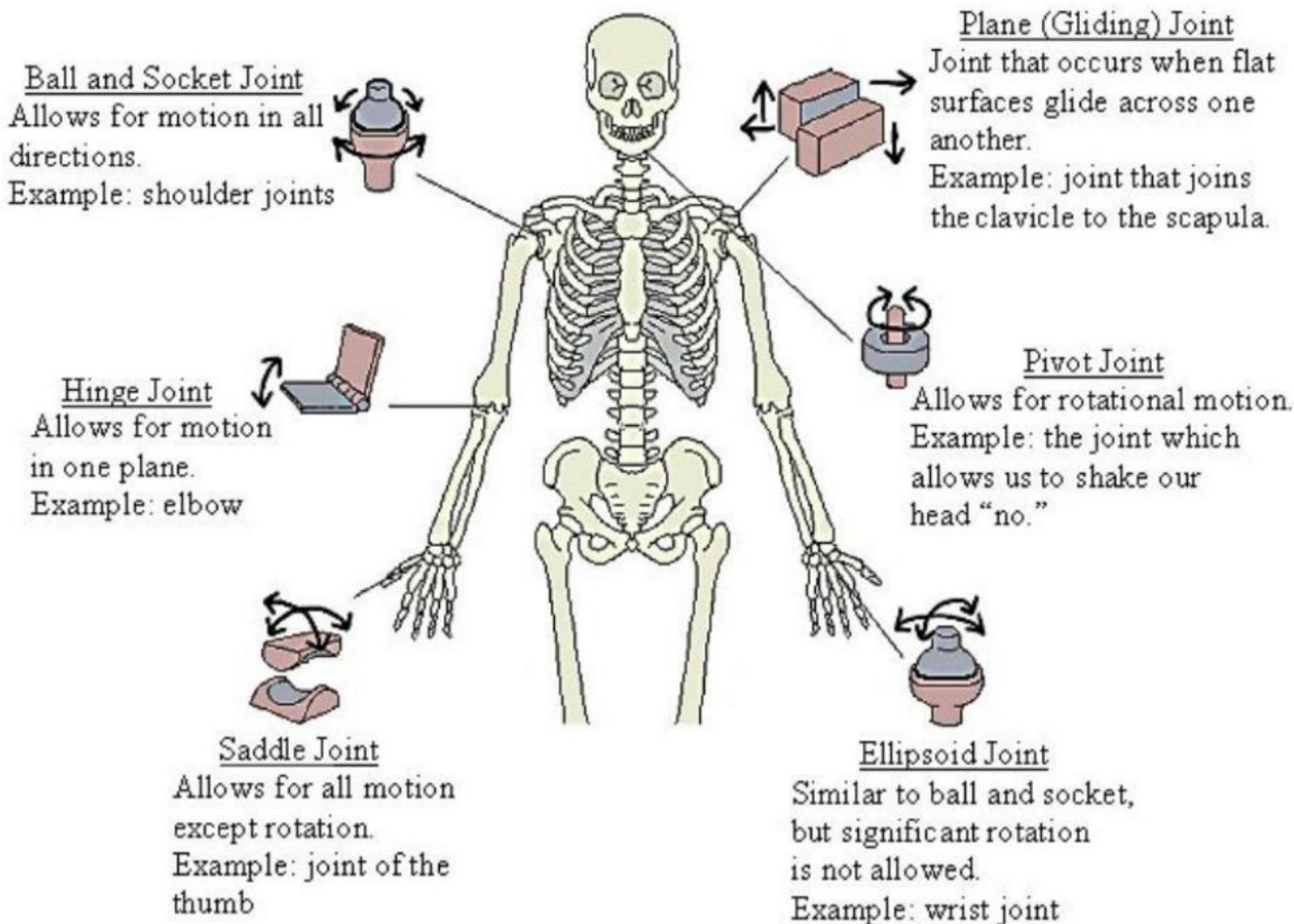
- **Pivotal Joints**
- In this type of joint, one bone has tapped into the other in such a way that full rotation is not possible.
- This joint aid in sideways and back-forth movement.
- An example of a pivotal joint in **the neck**.

- **Hinge Joints**
 - Hinge joints are like door hinges, where only back and forth movement is possible.
 - Example of hinge joints is the **ankle, elbows, and knee joints**.
- **Saddle Joints**
 - Saddle joint is the biaxial joint that allows the movement on two planes—flexion/extension and abduction/adduction.
 - For example, **the thumb is the only bone** in the human body having a saddle joint.

- **Condyloid Joints**
- Condyloid joints are the joints with two axes which permit **up-down and side-to-side** motions.
- The condyloid joints can be found **at the base of the index finger, carpals of the wrist, elbow and the wrist joints.**
- This joint is also known as a **condylar, or ellipsoid joint.**

- **Gliding Joints**
- Gliding joints are a common type of synovial joint.
- It is also known as a **plane or planar joint**.
- This joint permit two or more round or flat bones to move freely together without any rubbing or crushing of bones.
- This joint is mainly found in those regions where the two bones meet and glide on one another in any of the directions.
- **The lower leg to the ankle joint and the forearm to wrist joint** are the two main examples of gliding joints.

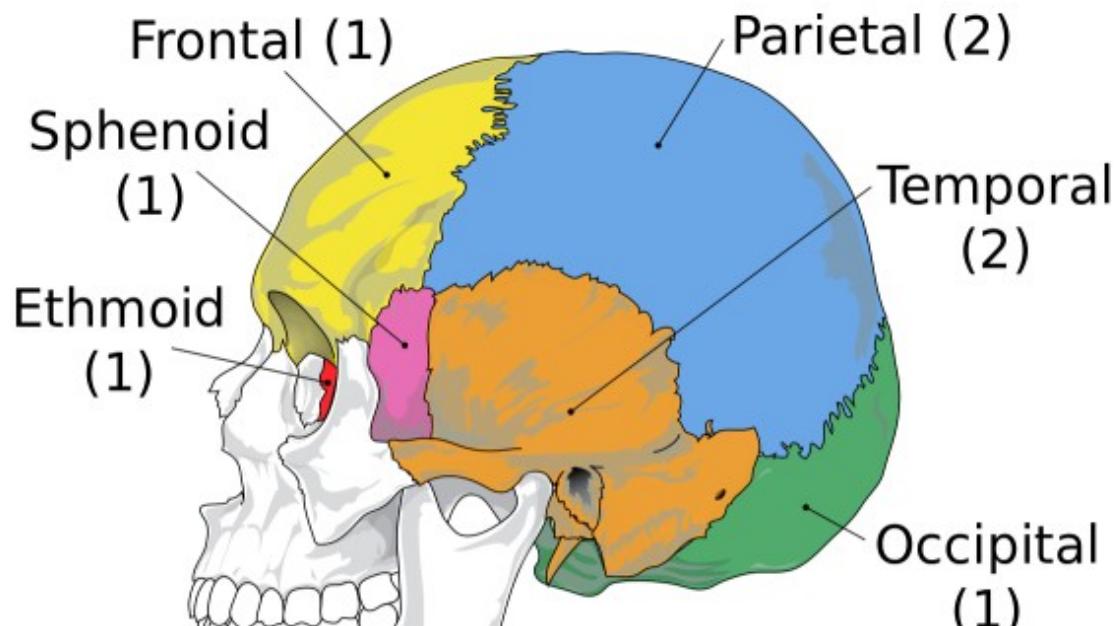
FIGURE 4.8
The Six Major Types of Synovial Joints



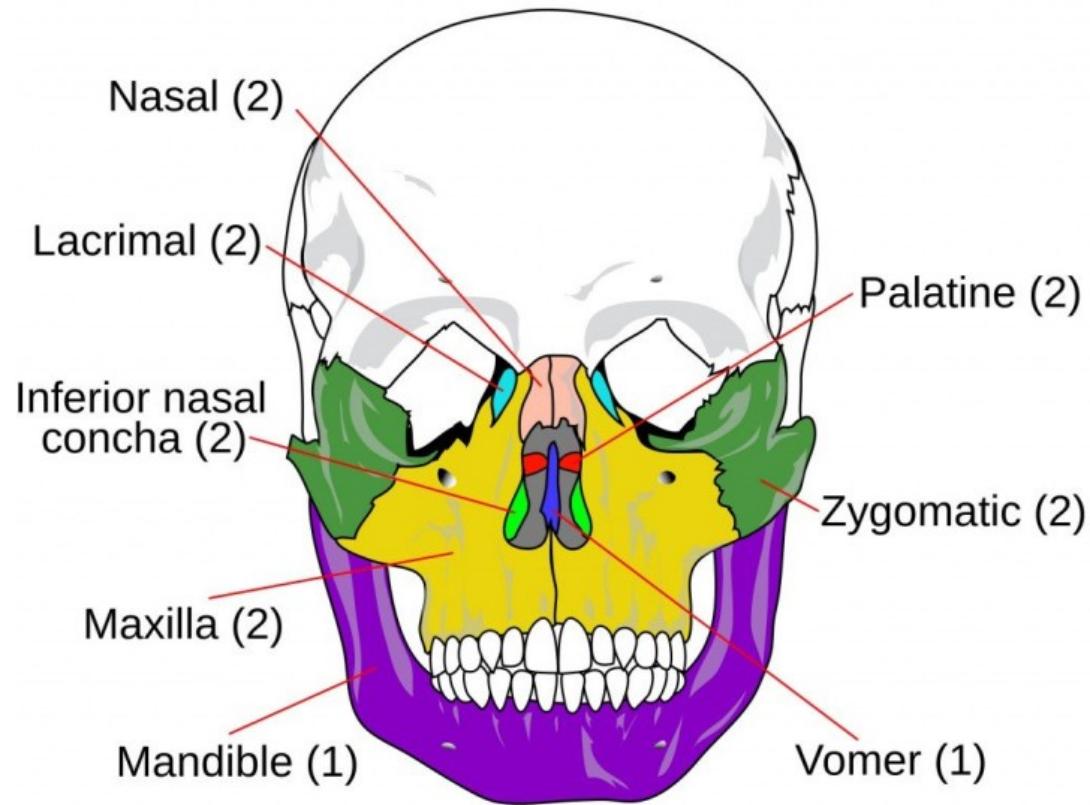
Cranium

- The **cranium**, or **skull**, protects the brain and related structures.
- The major cranial bones are held together with joints called **sutures**.
- These bones are not completely joined in a newborn, creating “soft-spots” or **fontanelles**. As the child matures, fontanelles become smaller and eventually close completely.
- temporal bone and mandible come together at the **temporomandibular joint**. This joint receives considerable use when talking and chewing.

- Cranium and face are the two main parts of the skull. The cranium is composed of **8 bones** while the face is made up of 14 bones.



8 Cranial Bones



14 Facial Bones

TABLE 15-2 CRANIAL AND FACIAL BONES

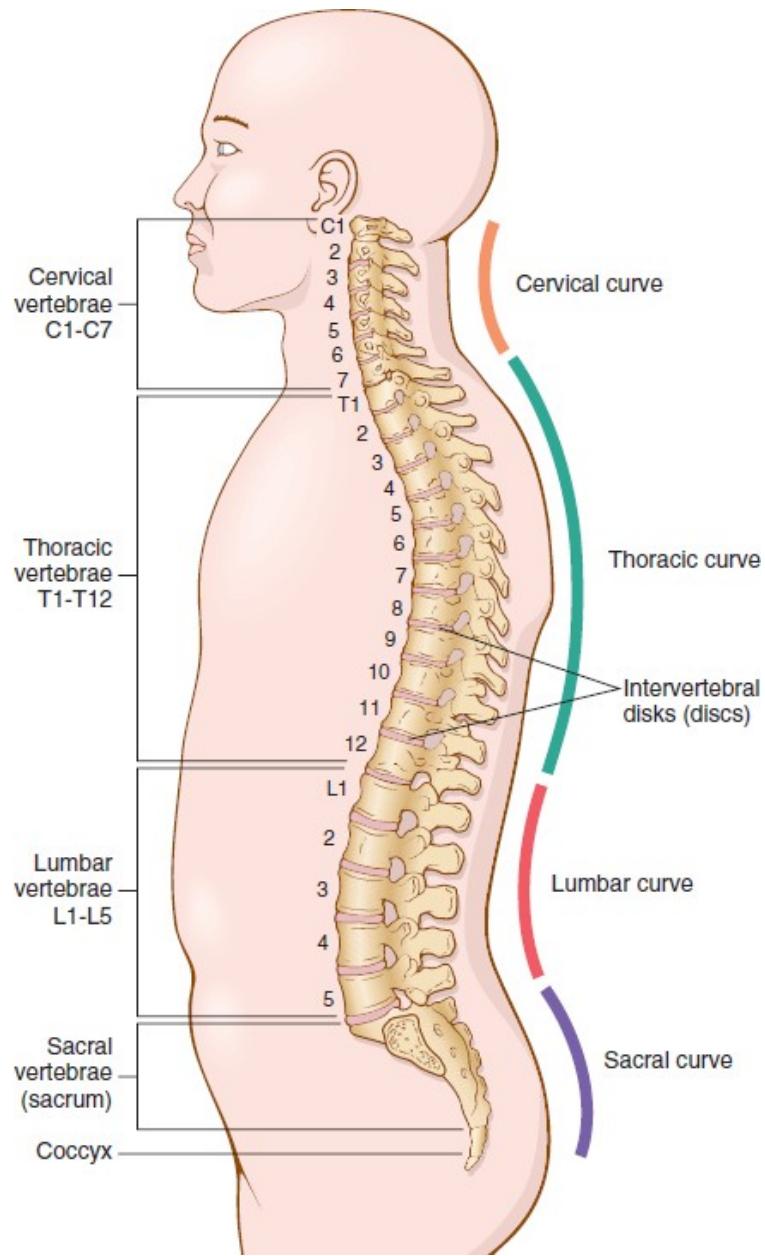
CRANIAL BONES	LOCATION
Ethmoid bone	Supports nasal cavity and eye sockets
Frontal bone	Forehead; part of eye sockets
Occipital bone	Back and base of skull
Parietal bones	Top and sides of skull
Sphenoid bone	Base of skull and behind eyes (bat-shaped bone)
Temporal bones	Lower sides and back of skull
FACIAL BONES	LOCATION
Lacrimal bones	Corners of each eye
Mandible	Lower jawbone
Maxillae	Upper jawbones
Nasal bones	Bridge and septum of nose
Vomer	Nasal septum (thin, flat bone)
Zygomatic bones	Cheek bones

The Vertebral Column

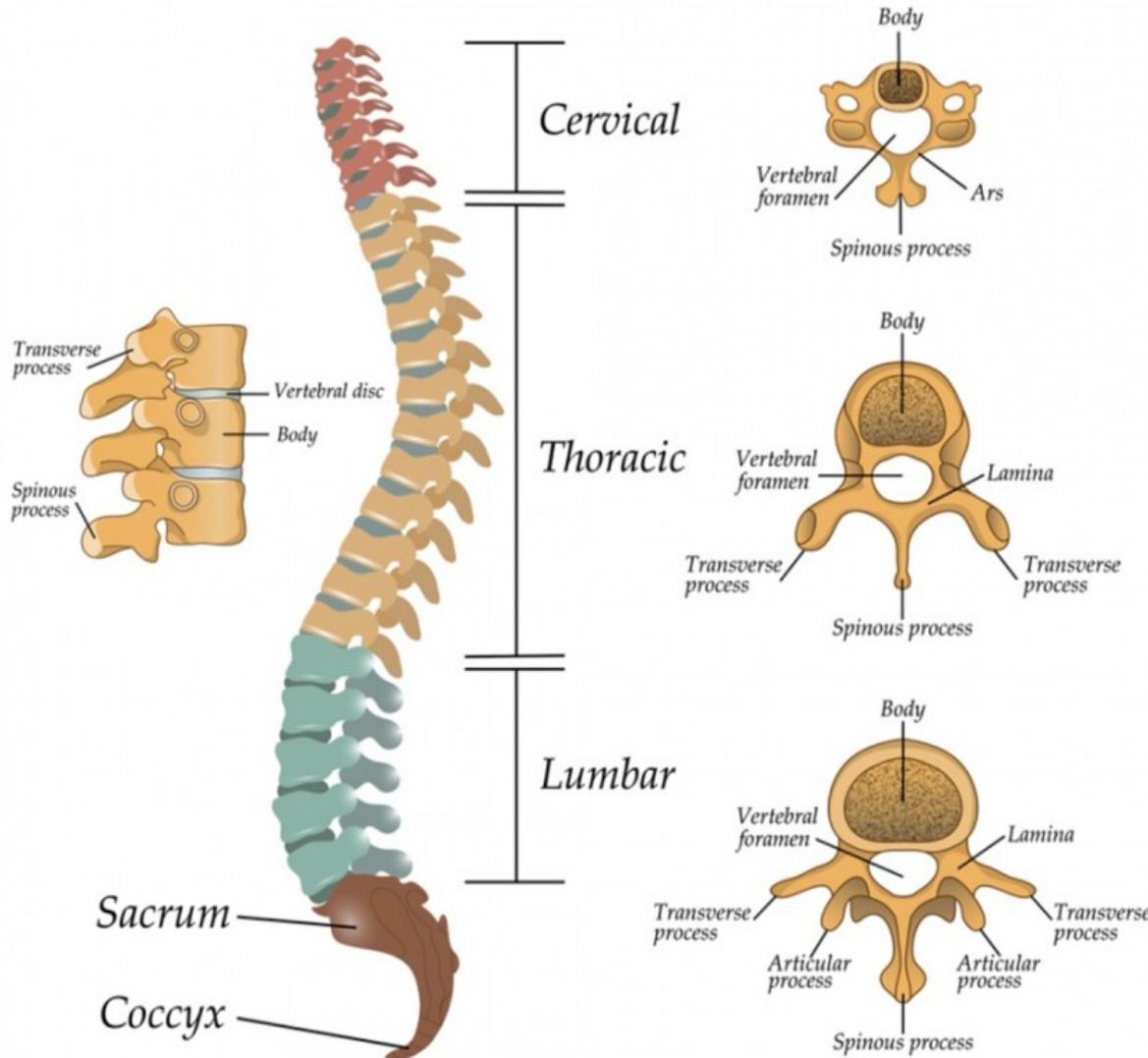
- The **vertebral column** (also called the **spine** or **backbone**) is a flexible column of 33 smallbones called **vertebrae**.
- In addition to providing support and movement for the trunk and head, the vertebral column protects the spinal cord, which carries nerve impulses between the brain and the rest of the body

- Each vertebra has two components: an anterior solid portion called the **body** and a posterior segment called the **arch**.
- The vertebral bodies stack atop one another with **intervertebral disks** between them to create the column that supports the trunk and cranium.
- The arches create a hollow passage behind the vertebral bodies for the spinal cord to pass through.
- The vertebrae are separated by **intervertebral disks** comprised of dense connective tissue.

C1- ATLAS C2 - AXIS



The structure of the segments of the spine

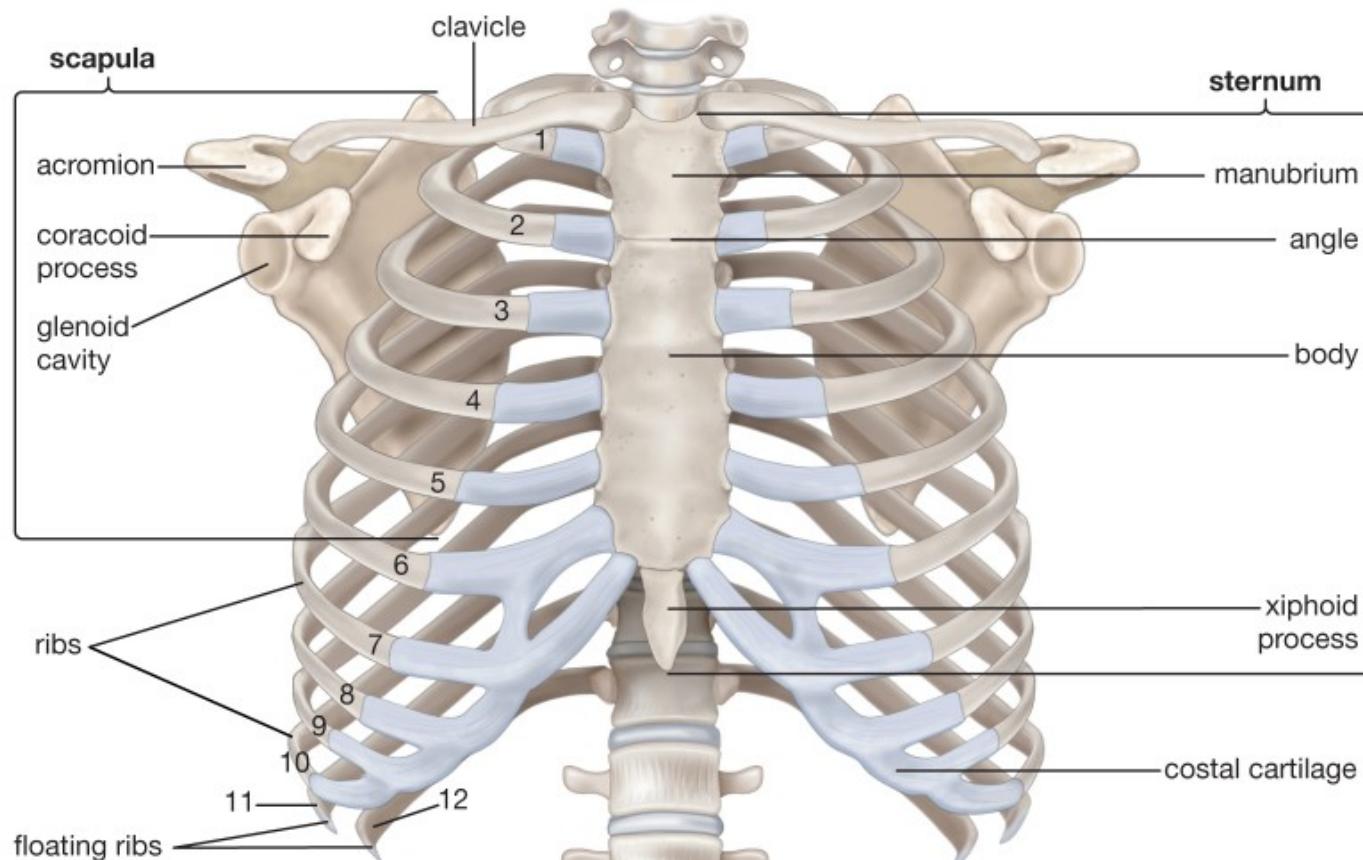


THORAX

- The heart and lungs are protected by the thorax, which is comprised of the **sternum** (breastbone), the **ribs**, and the thoracic **vertebrae**.
- there are 12 pairs of ribs. Each pair is attached to one of the thoracic vertebra.
- The first seven pairs are called the **true ribs**. Each of the true ribs is attached to the sternum by a piece of costal cartilage.
- The next five pairs, known as the **false ribs**, do not attach directly to the sternum and lie inferior to the true ribs.
- The first three pairs of false ribs attach indirectly to the sternum via a band of costal cartilage that fuses into the costal cartilage of the last true rib.
- Below these three pairs lie the last two pairs of false ribs known as **floating ribs**.
- The floating ribs are attached to the thoracic vertebrae posteriorly but have no costal cartilage and are not connected to the sternum.

RIBS

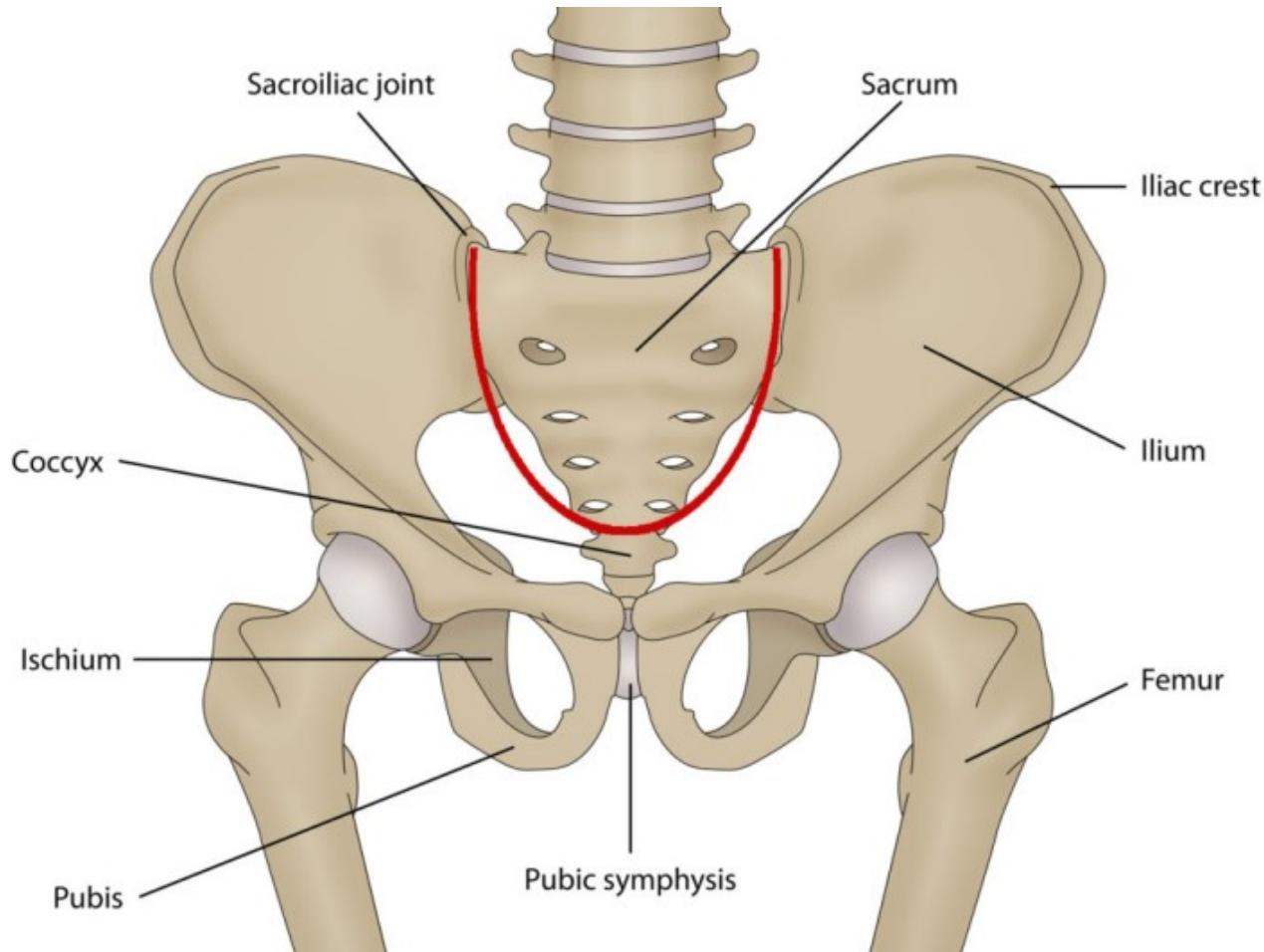
Bones of the human thorax



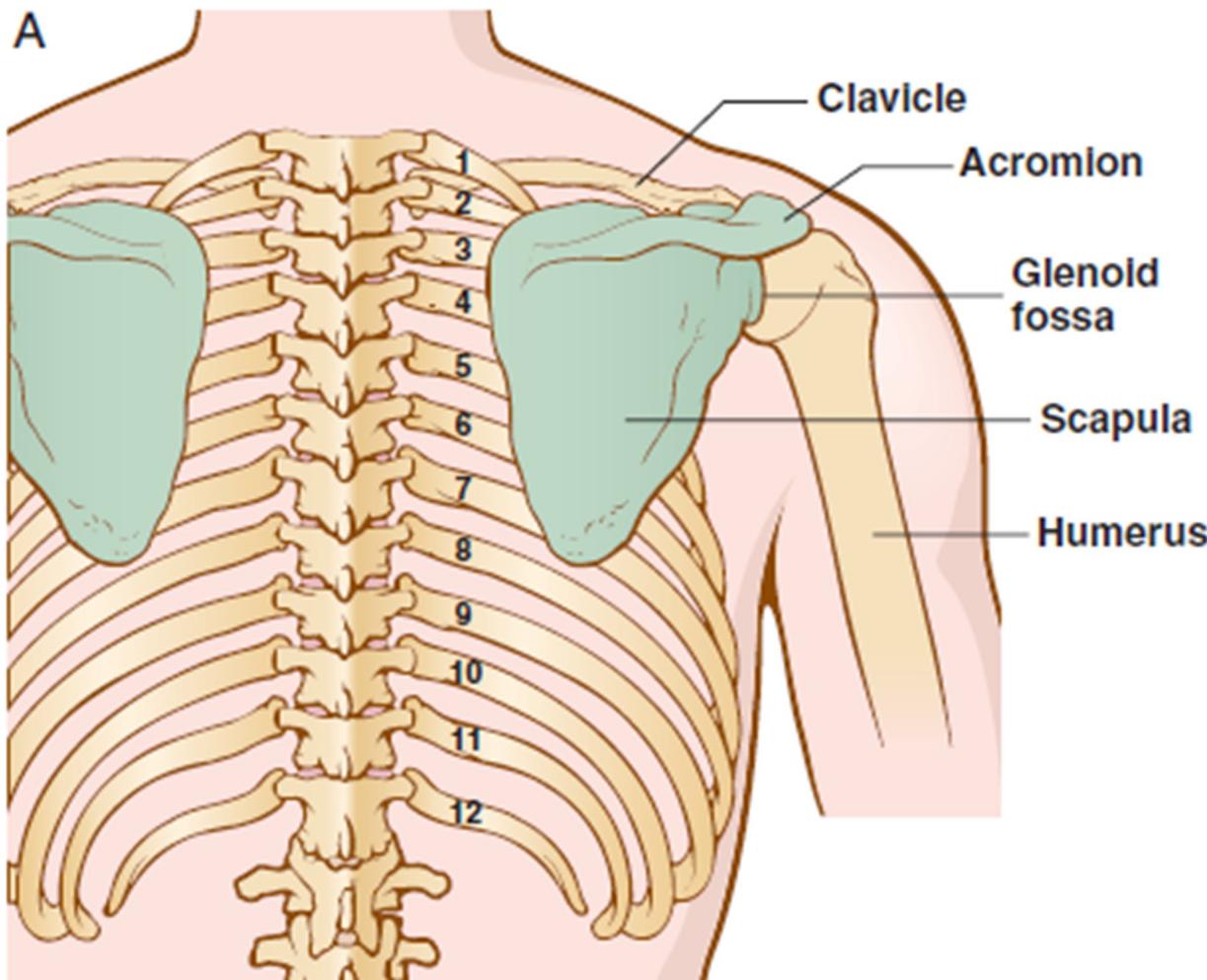
PELVIS

- The **pelvic bone**, also known as the **innominate bone**, is a composite of the **ilium, ischium, and pubis bones**.
- The pelvic bone provides a place of attachment for the thigh bones and serves as a base of support for the spine.
- It also supports the organs of the abdominopelvic cavity, including the urinary bladder, sigmoid colon, rectum, and female reproductive organs.
- The pelvic bones of males and females have significant differences.
- The female pelvis is shallower and wider. This provides support as the uterus grows during pregnancy. It also provides a wider opening for the infant to pass through during childbirth.

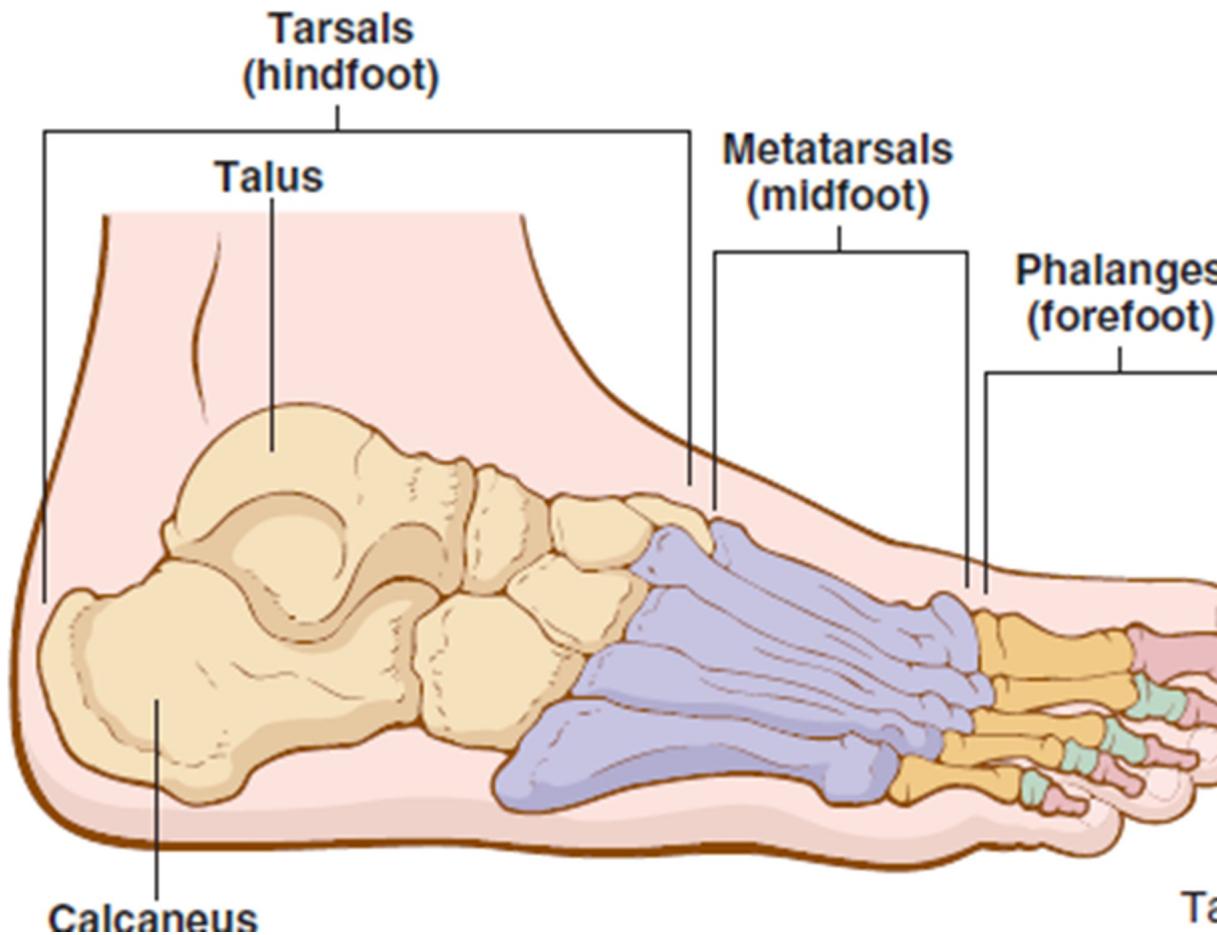
PELVIC BONE

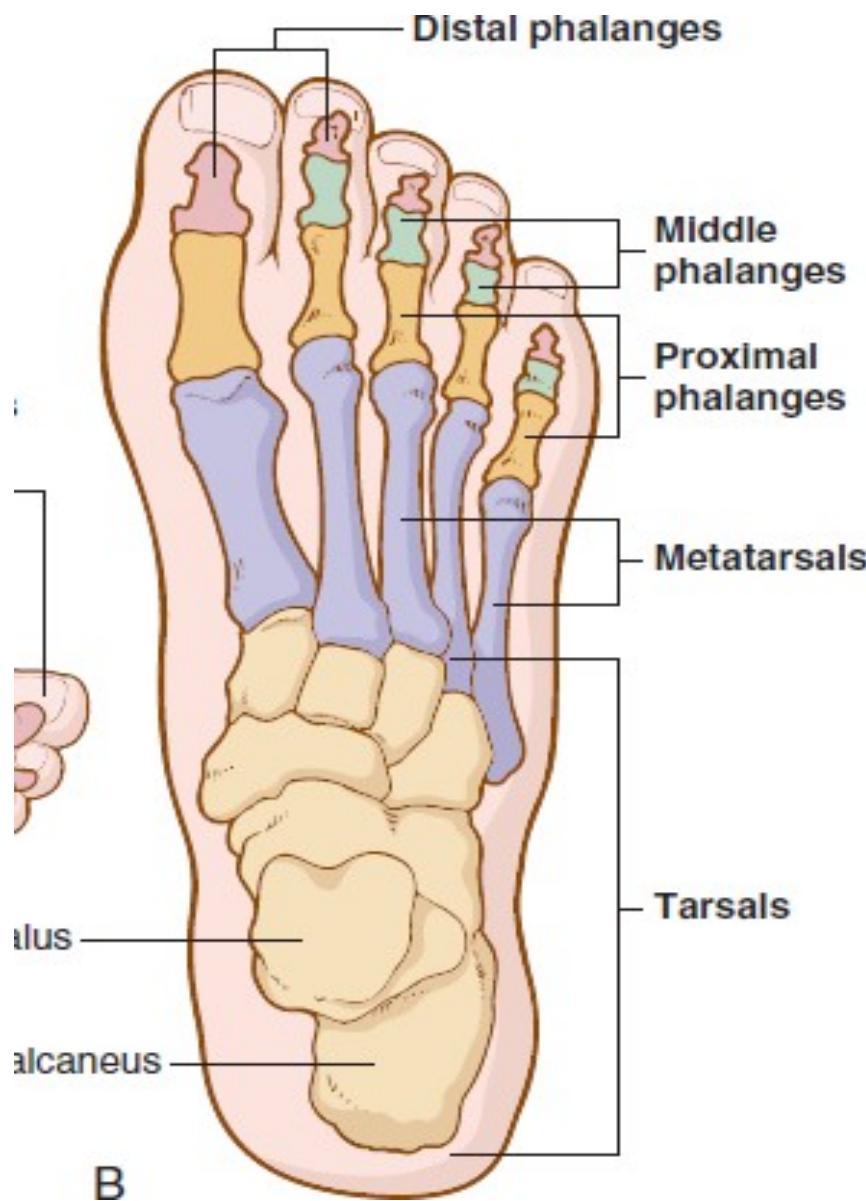


SHOUDLER



FOOT

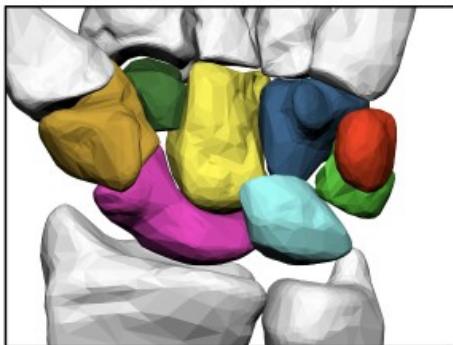




B

Carpal Bones

- | | |
|--------------|-------------|
| ● Scaphoid | ● Trapezium |
| ● Lunate | ● Trapezoid |
| ● Triquetrum | ● Capitate |
| ● Pisiform | ● Hamate |



Tarsal Bones

Inferior view

- Calcaneus
- Talus bone
- Cuboid bone
- Navicular bone
- Cuneiform bones

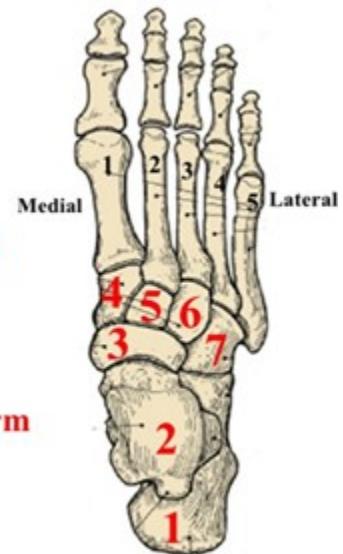
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Tarsals

Dorsal view (top of foot); Rt. foot

- 1 = Calcaneus (heel bone)
- 2 = Talus (ankle bone)
- 3 = Navicular
- 4 = Medial Cuneiform
- 5 = Intermediate Cuneiform
- 6 = Lateral Cuneiform
- 7 = Cuboid



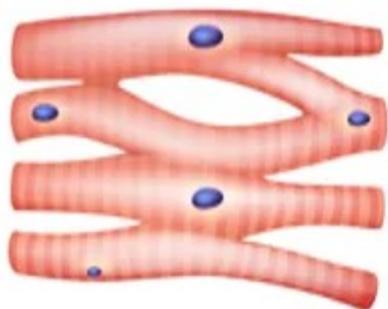
Bone or Process	Common Name	Bone or Process	Common Name
Acetabulum	Hip socket	Metacarpals	Hand bones
Calcaneus	Heel	Metatarsals	Midfoot bones
Carpals	Wrist bones	Olecranon	Elbow
Clavicle	Collar bone	Patella	Kneecap
Coccyx	Tailbone	Phalanges	Finger and toe bones
Cranium	Skull	Pubis	Anterior part of the pelvic bone
Femur	Thigh bone	Radius	Forearm bone—thumb side
Fibula	Smaller of the two lower leg bones	Scapula	Shoulder blade
Humerus	Upper arm bone	Sternum	Breastbone
Ilium	Upper part of pelvic bone	Tarsals	Hindfoot bones
Ischium	Inferior or lower part of the pelvic bone	Tibia	Shin bone—larger of the two lower leg bones
Malleolus	Ankle	Ulna	Forearm bone—little finger side
Mandible	Lower jawbone	Vertebra	Backbone/spine
Maxilla	Upper jawbone		

MUSCLES

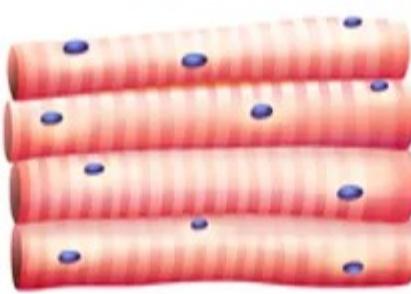
- **Muscles** are highly specialized tissues that can contract, or become shorter. This contraction is what allows for body movement.
- two types of movement: **voluntary and involuntary**.
- **Voluntary movement** is movement controlled by conscious thought, such as moving an arm or leg.
- **Involuntary movement** is not ordinarily under conscious control. Examples of involuntary movement are the contractions of heart muscle or the contractions of smooth muscle in the digestive tract.

- **Striated muscle** makes up the **voluntary or skeletal** muscles that move all bones, as well as controlling facial expression and eye movements.
- **Smooth muscle** makes up the **involuntary or visceral** muscles that move internal organs such as the digestive tract, blood vessels, and secretory ducts leading from glands.
- These muscles are controlled by the autonomic nervous system
- **Cardiac muscle** is **striated** in appearance but is like smooth muscle in its action. Its movement cannot be consciously controlled

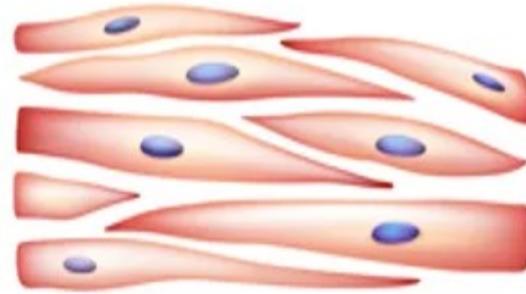
Types of Muscle



Cardiac muscle



Skeletal muscle



Smooth muscle

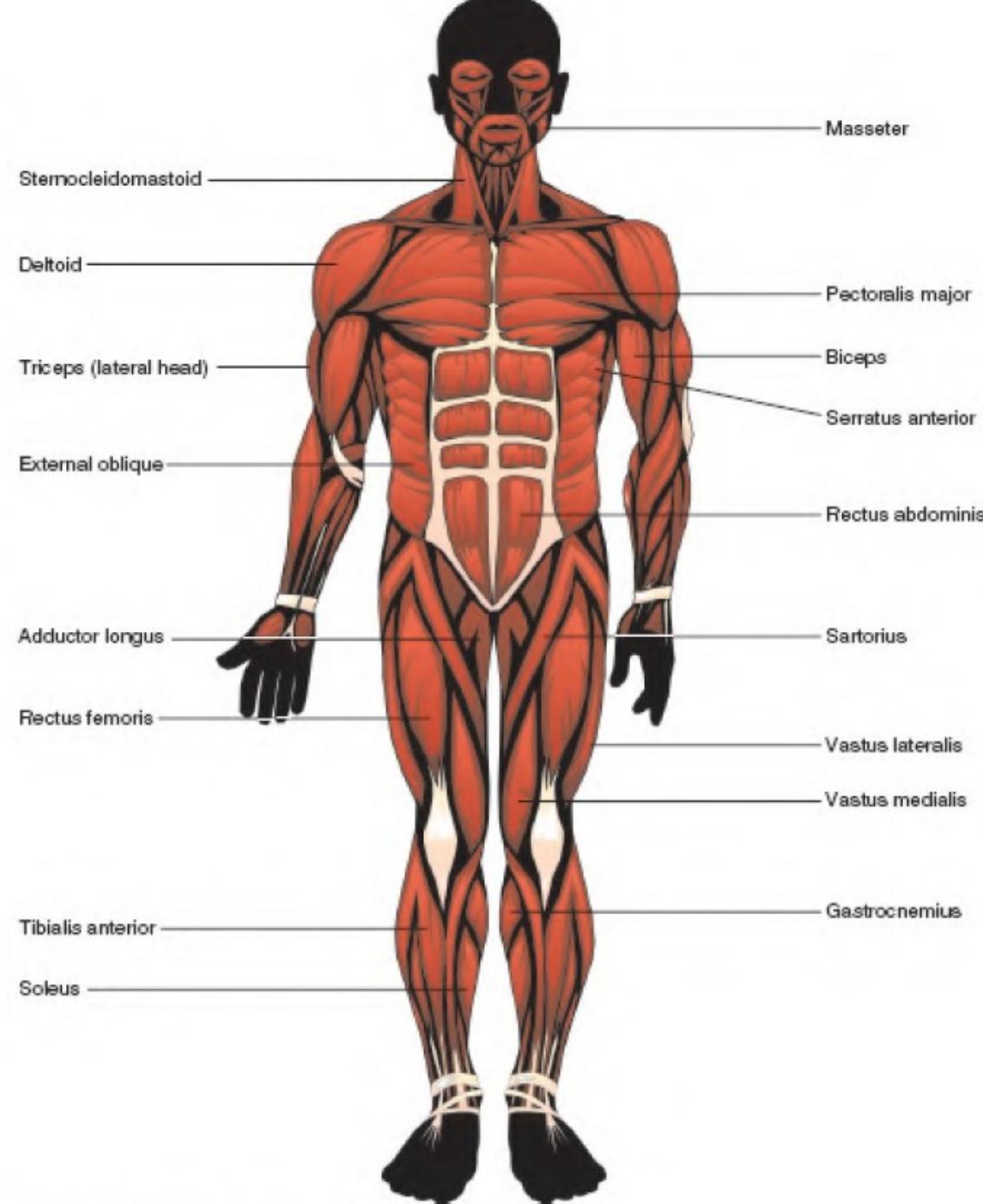


Figure 17-6 Major Muscles (Anterior View)

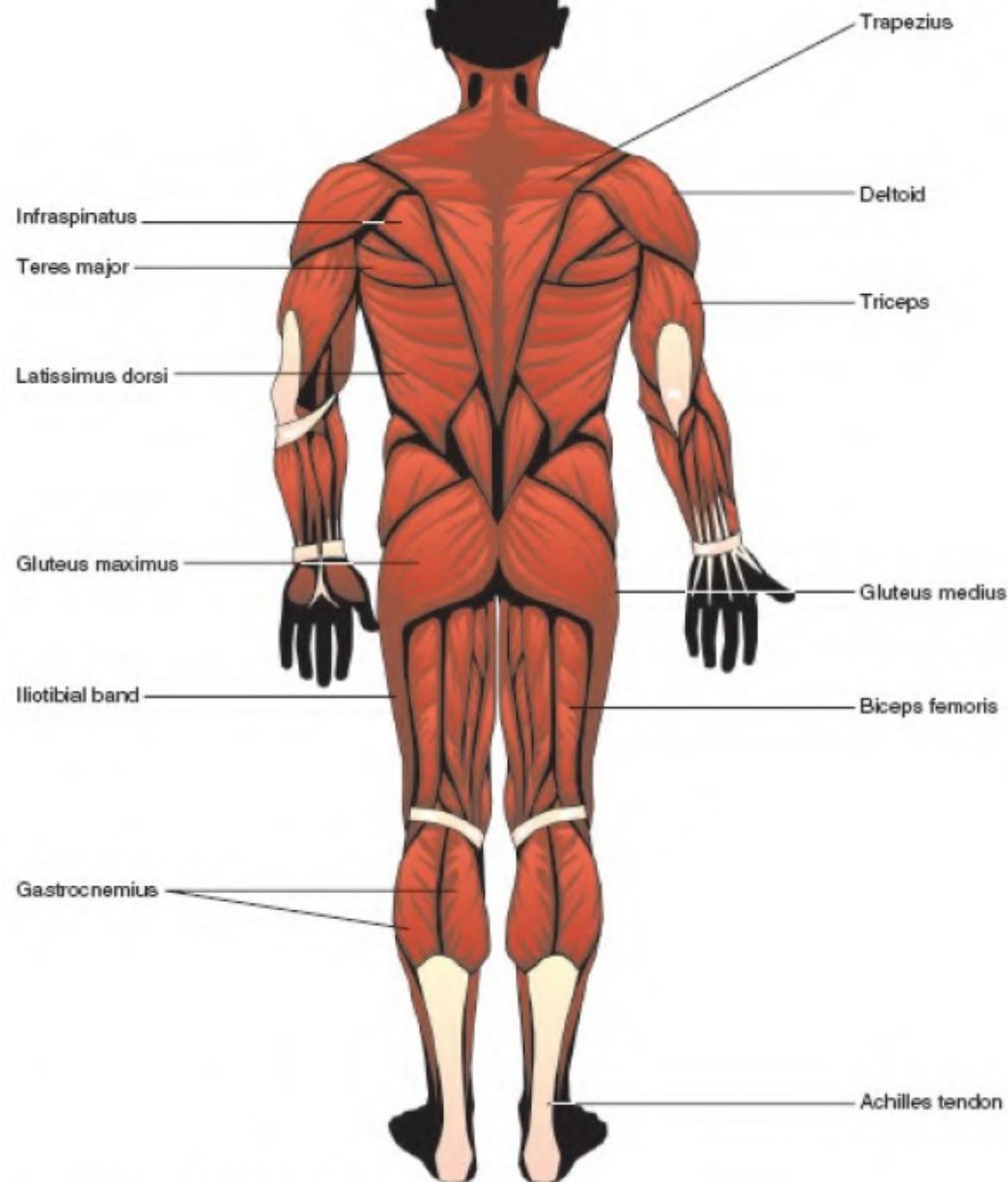


Figure 17.6 (cont'd.) Major Muscles (Posterior View)

FRACTURES

- The term **fracture** is generally used to mean the breaking of bone or cartilage and can have a number of causes such as trauma or osteoporosis.
- **Fractures can be classified in many different ways.**
- **A compound (or open) fracture occurs when fractured bone perforates the skin resulting in a visible wound.**
- **In a closed (or simple) fracture, the skin has not been broken.**
- **Another way of describing fractures is by their location on the bone itself:**
 - proximal toward the trunk
 - distal away from the trunk
 - midshaft near the middle of the diaphysis (shaft)
- **Fractures are also identified by type and direction of the fracture line.**
- **Fractures of the spine are usually identified by the vertebrae involved.**

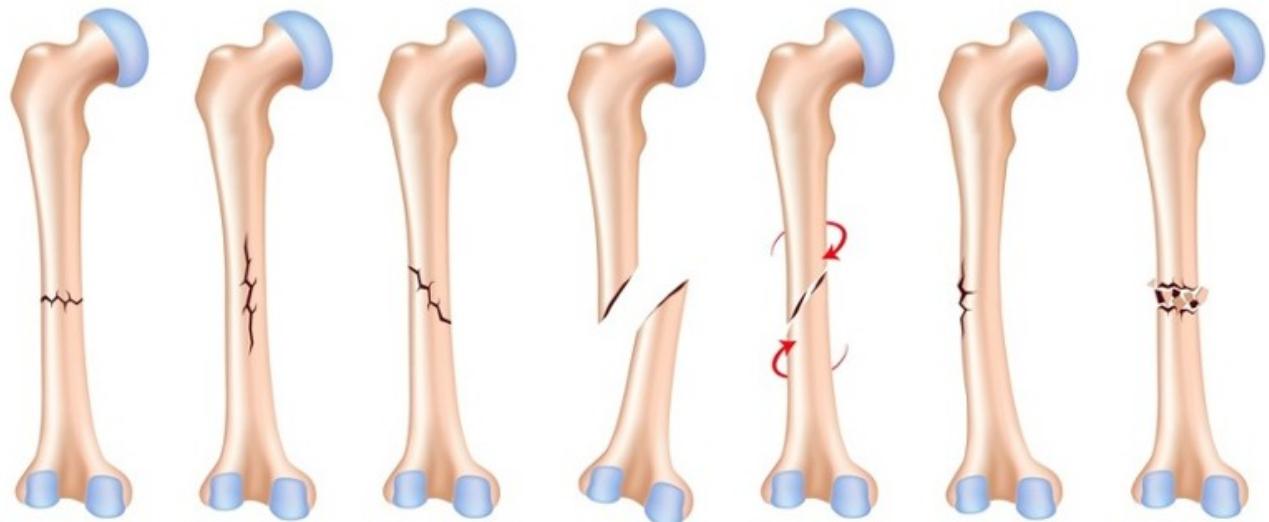
Term	Description
comminuted	Fracture involves three or more fragments.
(open) compound	Fracture perforates the skin.
compressed	Bone is crushed. Commonly used in reference to vertebrae.
depressed	Bone is pushed or displaced inward. Commonly used in reference to the skull (cranium).
dislocation	Disarrangement of the normal placement of bones at a joint. Is not a fracture and may or may not occur concurrently with a fracture.
greenstick	Bone is bent with an incomplete fracture occurring on the convex side of the bend.
hairline	Fine fracture is present, but bone is in perfect alignment.

impacted	One bone fragment is driven into another bone fragment.
longitudinal	Fracture is parallel with the long axis of the bone.
oblique	Fracture occurs at a diagonal to the long axis of the bone.
pathological	Fracture is caused by a disease process.
segmental (double)	Two fractures occur in the same bone.
simple (closed)	Fracture does not break the skin.
spiral	Fracture spirals like a helix up and around the bone.
stress fracture	Small break in a bone caused by repeated or prolonged use rather than one-time trauma.
transverse	Break is across the bone at a right angle to the long axis.

Colles

Near the wrist at distal end of the radius

Types of Bone Fractures



Transverse

Linear

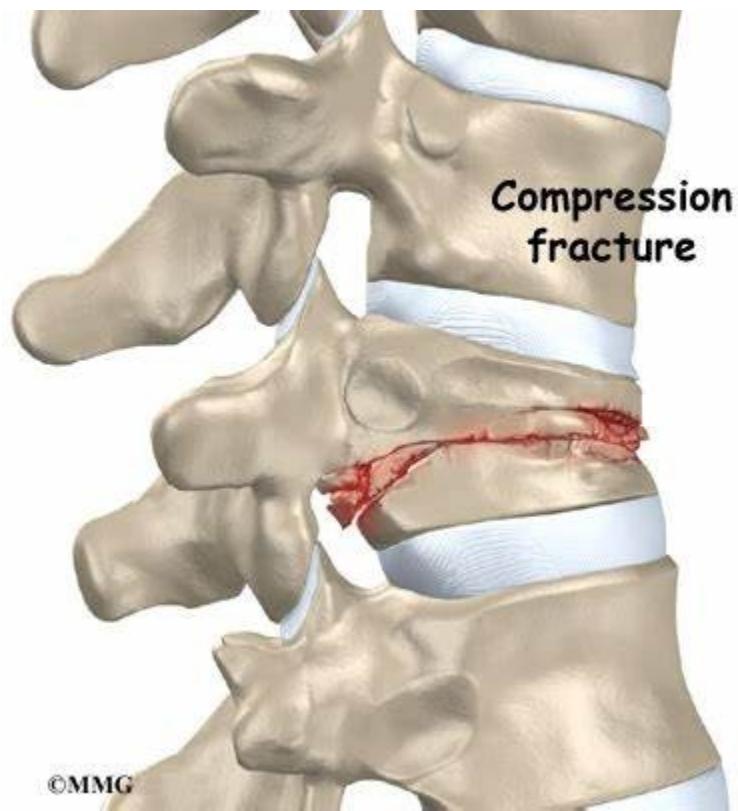
Oblique,
nondisplaced

Oblique,
displaced

Spiral

Greenstick

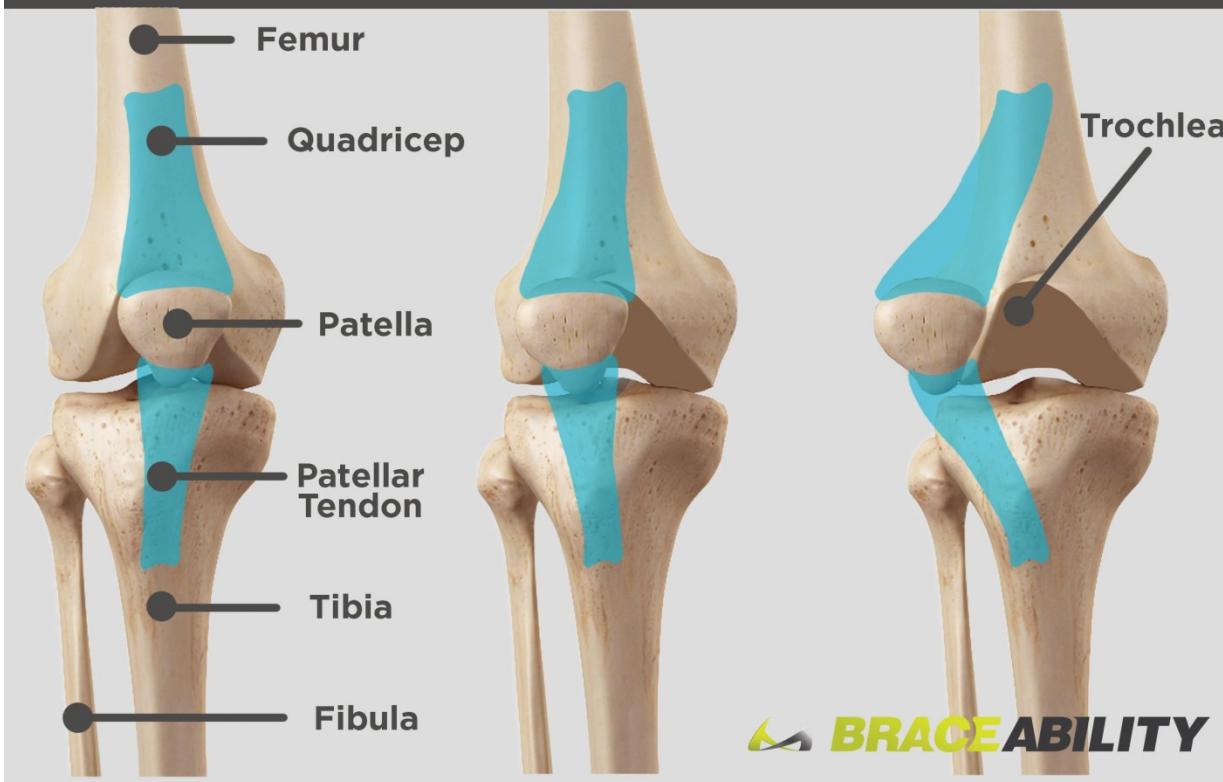
Comminuted



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Healthy Subluxated Dislocated



- The **Le Fort classification** is frequently used to describe fractures of the facial bones.
- Fractures of the epiphyseal plate are described using the **Salter-Harris classification of epiphyseal plate injuries**

TREATMENT OF FRACTURES

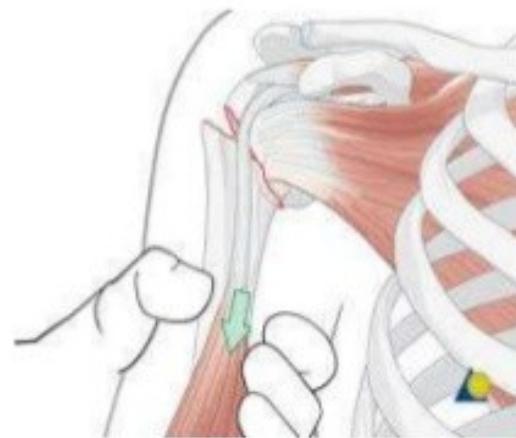
- Treatment of fractures involves reduction, which is restoration of the bone to its normal position.
- A **closed reduction** is manipulative reduction without a surgical incision;
- in an **open reduction**, an incision is made for access to the fracture site.
- A **cast** (solid mold of the body part) is applied to fractures to immobilize the injured bone after a closed reduction.
- The abbreviation **ORIF** means **open reduction/internal fixation**. Often this involves insertion of metal plates, screws, rods, or pins to stabilize the bone.

Closed reduction

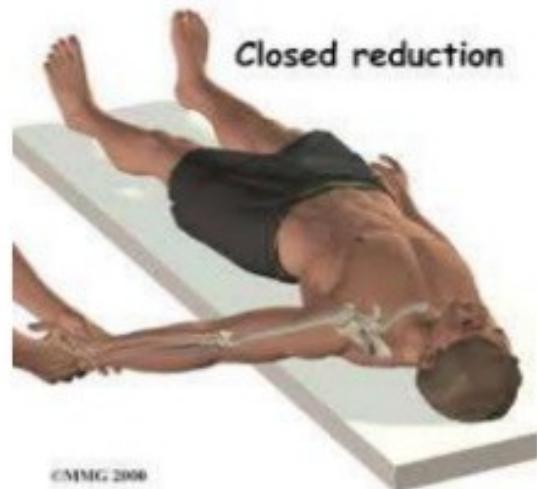
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Closed reduction



Open Reduction and Internal Fixation of Right Distal Radius Fracture



CAST

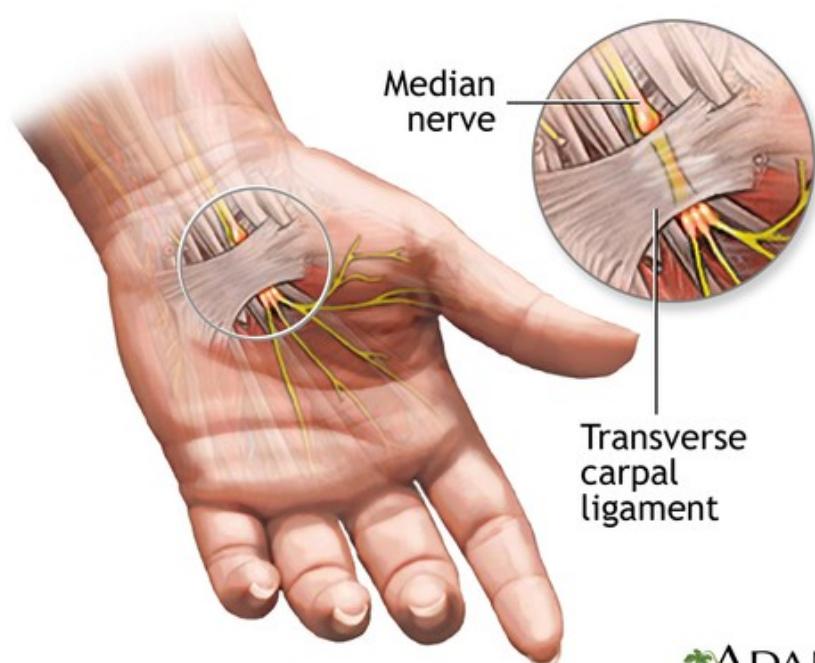
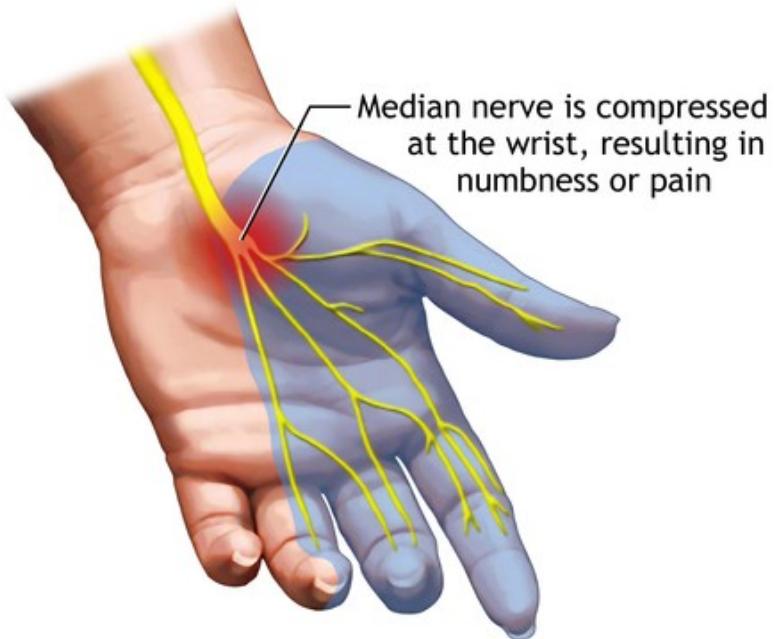


PATHOLOGY

Condition or Disease	Description
Achilles tendonitis	Inflammation of the Achilles tendon.
ankylosing spondylitis	Chronic systemic arthritis involving inflammation and stiffening of the axial skeleton and the large peripheral joints.
ankylosis	Stiffening or fixation of a joint.
arthralgia	Pain in a joint. Also called <i>arthrodynia</i> .
arthritis	A variety of conditions involving inflammation of the joints.
arthropathy	Any disease that affects a joint.
articular disease	Any disease involving the joints. These conditions include arthritis, rheumatoid arthritis, osteoarthritis, gout, and bursitis.

avascular necrosis	Death of bone tissue caused by inadequate blood supply. Can be caused by several conditions such as trauma, fracture, osteoarthritis, and systemic lupus erythematosus. Can be idiopathic. Also called <i>osteonecrosis</i> .
bunion	A type of bursitis that affects the joint at the base of the great toe.
bursitis	An acute or chronic inflammation of the bursa. Occurs most commonly in the shoulders and elbows, but can occur in any bursa.
carpal tunnel syndrome (CTS)	Compression of the median nerve as it passes through the tunnel in the wrist containing the median nerve and blood vessels. It is frequently

CARPAL TUNNEL SYNDROME



ADAM.

	caused by repeated flexion and extension of the wrist. Can lead to pain, tingling, and numbness.
claudication Limping.	Usually intermittent.
discoid lupus erythematosus (DLE)	A chronic disorder of unknown etiology that primarily affects the skin. Characterized by macules, plaques, and scales that appear on the skin.
Ewing tumor	A malignant bone tumor that occurs most commonly in individuals between 10 and 20 years of age. Occurs most often in long bones in the extremities. Tends to involve extensive portions of a bone. Also called Ewing sarcoma.

fibromyalgia	A group of disorders characterized by aching, tenderness, and stiffness of muscles, tendons, and adjacent soft tissues.
fracture	Any break in bone or cartilage. See Tables 17-2, 17-3, and 17-4 for information on fracture terminology.
ganglion	A fluid-filled cyst most commonly attached to a tendon sheath in the wrist, hand, or foot.
genu valgum (pl. genuvalgus)	A deformity of the lower extremity characterized by lateral angulation of the leg in relation to the thigh. Also called <i>knock-knee</i> or <i>knocked-kneed</i> .
genu varum (pl. genuvarus)	A deformity of the lower extremity characterized by medial angulation of the leg in relation to the thigh. Also called <i>bowleg</i> or <i>bowlegged</i> .



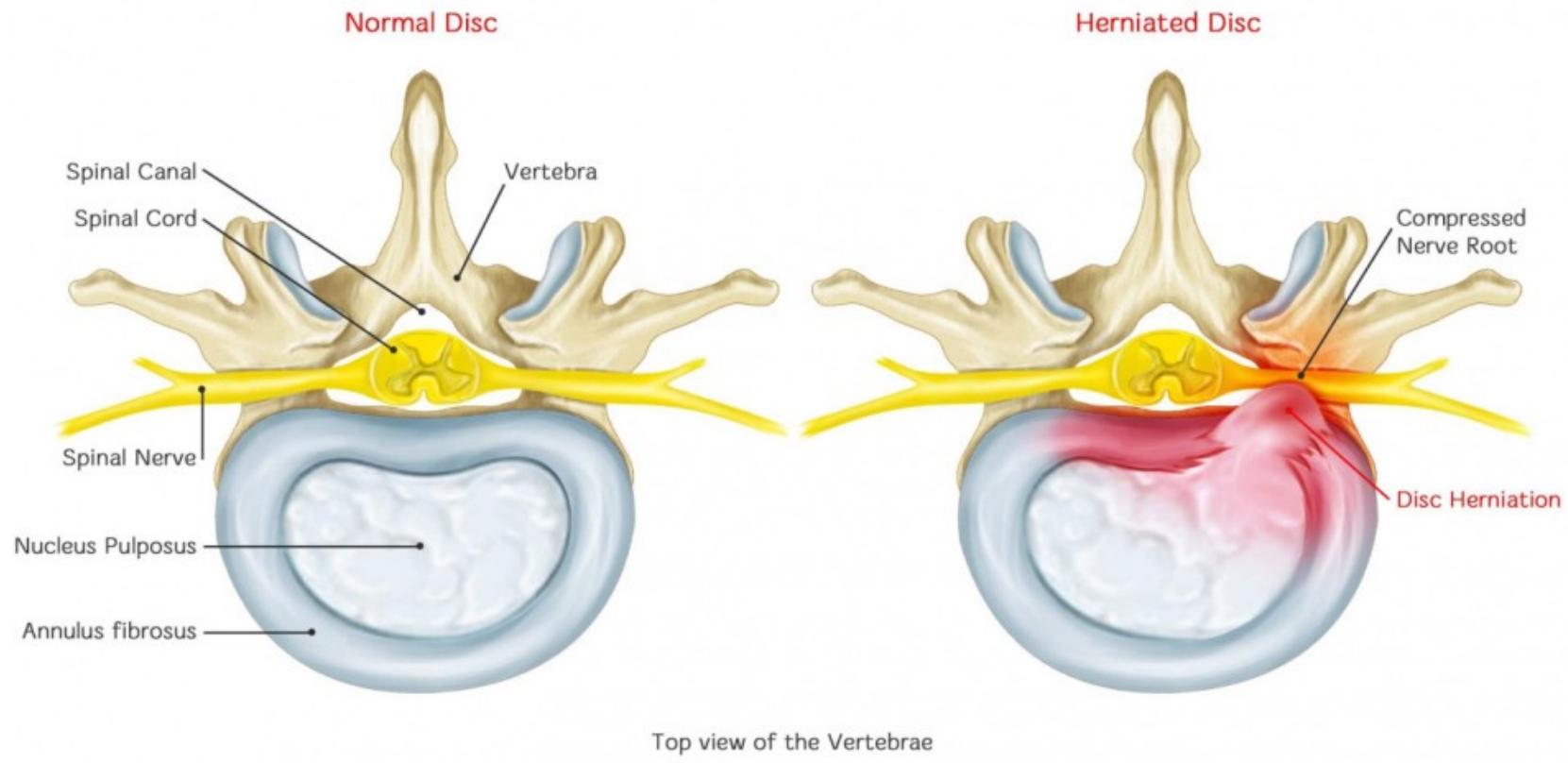
Genu Valgum
“Knock-Knee”



Genu Varum
“Bow-legged”

gout	A metabolic disorder characterized by abnormally high level of uric acid in the blood. Leads to recurrent bouts of acute or chronic arthritis, resulting from deposits of sodium urate crystals in articular cartilage and various connective tissues.
Herniated intervertebral disk	A rupture in which all or part of the gelatinous central portion of a disk is forced through a weakened outer portion of the disk. It can cause severe back pain. Also called <i>herniated nucleus pulposus</i> .
infectious arthritis	Inflammation of one or more joints caused by bacterial, fungal, or viral infection.
kyphosis	An abnormal, exaggerated posterior curvature of the thoracic spine that may result in severe body flexion (forward leaning). Commonly called <i>hunchback</i> or <i>humpback</i> .
lordosis	An abnormal, exaggerated anterior curvature of the lumbar spine that may result in severe body extension (leaning backward). Commonly called <i>swayback</i> or <i>saddle back</i> .

Disc Herniation



SPINAL ABNORMALTIES



Normal



Lordosis



Kyphosis



Scoliosis

Lyme disease	A recurrent inflammatory disorder caused by bacteria transmitted by a tick. Characterized by fever, headaches, stiff neck, severe arthritis and cardiac and/or neurologic symptoms.
metatarsalgia	Pain of the metatarsals in the front part or over the ball of the foot.
multiple myeloma	Malignant bone tumor involving plasma-producing (hemopoietic) cells in bone marrow. Usually occurs in multiple sites. Overgrowth of the plasma cells disrupts production of other blood components, resulting in anemia, hemorrhage, and recurrent infections. May also cause pain and necrosis (death) of the bone. Also called <i>myeloma</i> or <i>myelomatosis</i> .
osteoarthritis (OA)	A degenerative condition characterized by erosion of articular cartilage and hypertrophy of bone. Can be caused by acute trauma or chronic use of a joint. Commonly affects weight-bearing joints like the hip or knee. Also called <i>degenerative joint disease</i> and <i>osteoarthrosis</i> .
osteochondroma	A common benign bone tumor. Tends to occur near the ends of long bones. Occurs most commonly in individuals between 10 and 20 years of age.

osteomyelitis	Inflammation and destruction of bone and bone marrow, caused by bacterial or fungal infections.
osteoporosis	A generalized progressive loss of bone density. Leads to poor bone structure and skeletal weakness.
osteosarcoma	A malignant bone tumor. Found most commonly in the knee, but can occur in any bone. Also called <i>osteogenic sarcoma</i> .
Paget disease of bone	A chronic adult disorder in which hyperactive bone resorption results in thickened and softened areas of localized bone. Also called <i>osteitis deformans</i> .
polychondritis	Episodic inflammatory condition that destroys cartilage and other connective tissues in a variety of locations including the ears, joints, nose, and heart valves. Association with rheumatoid arthritis and systemic lupus erythematosus suggests an autoimmune mechanism.

Normal Knee

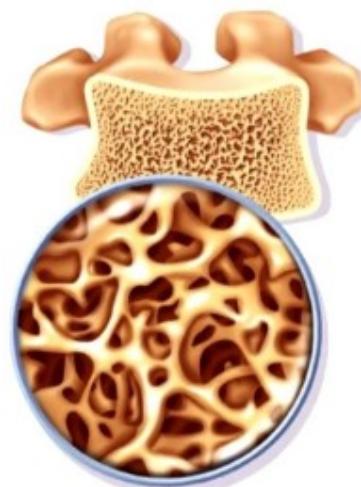


Osteoarthritis



osteoarthritis

NORMAL BONE



OSTEOPOROSIS



OSTEOPOROSIS vs OSTEOMALACIA

- Bone mass reduced, mineralization normal elderly
- Idiopathic, Endocrine abn., inactivity, disuse, alcoholism, calcium deficiency
- Bone mass variable, mineralization decreases
- Vitamin D or its metab. deficiency, hypophosphatasia syndromes, renal tubular acidosis

polymyalgia rheumatica	Muscle condition characterized by severe pain and stiffness in proximal muscle groups without muscle weakness or atrophy. Accompanied by elevated ESR.
polymyositis	Systemic connective tissue disease characterized by inflammation and atrophy of the muscles. Leads to symmetrical weakness.
posterior femoral muscle strain	Muscle strain causing acute pain in the posterior thigh. Also called <i>hamstring tear</i> .
rheumatoid arthritis (RA)	Chronic condition characterized by inflammation of the peripheral joints, potentially leading to destruction of the joints. The inflammation is nonspecific and usually symmetrical.
rickets	Childhood disease caused by vitamin D deficiency and lack of exposure to sunlight. Results in softening and bending of bones with associated skeletal deformities. Also called <i>rickets</i> .

RHEUMATOID ARTHRITIS



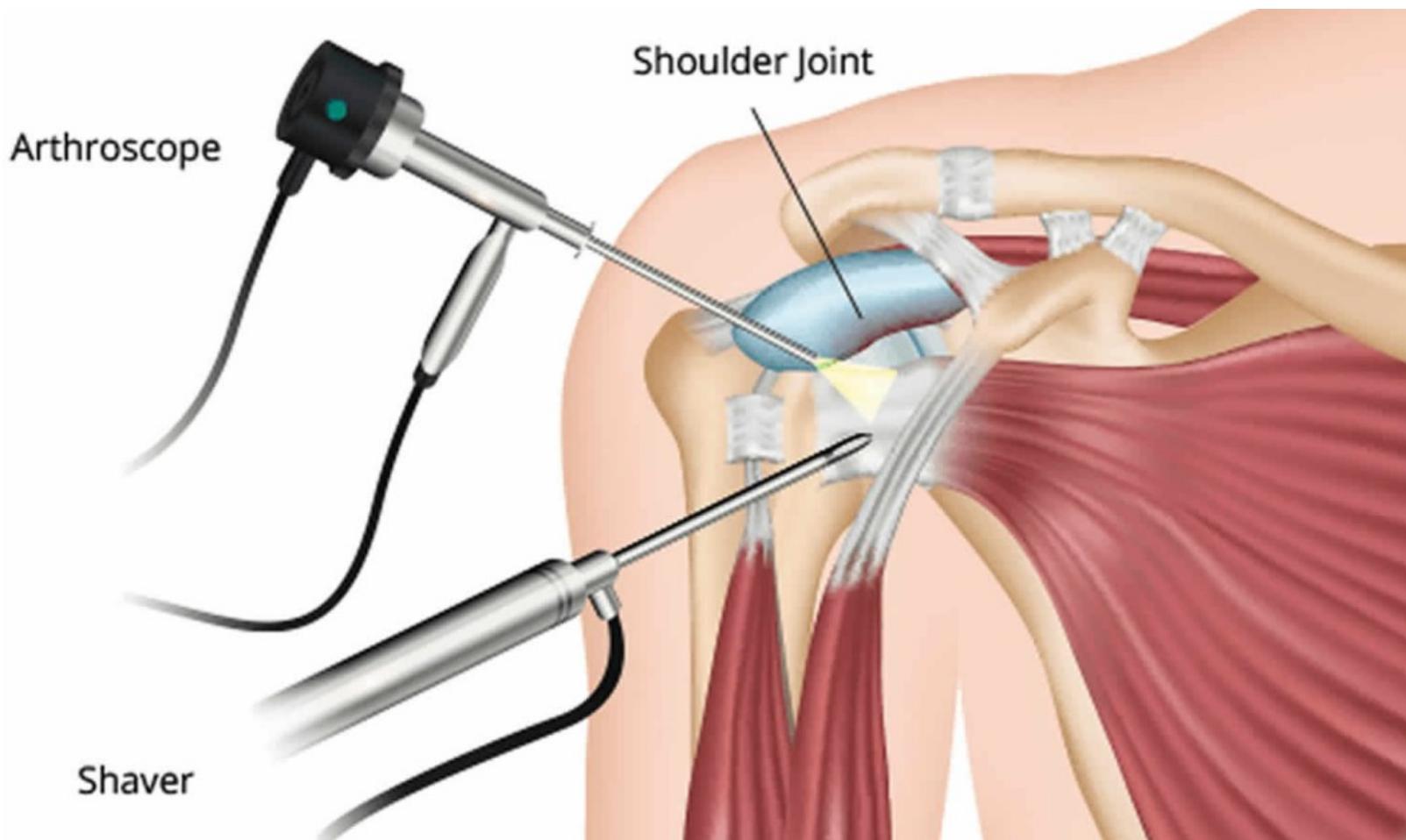
scoliosis	Abnormal lateral curvature of the spine. Can be idiopathic or hereditary. May be a result of muscle and/or bone deformity or chronic unequal muscle contraction.
shin splint	Tenderness and pain in the anterior muscles of the lower leg. Frequently caused by muscle damage incurred during sports activities involving running.
Sjogren syndrome (SS)	Chronic, systemic inflammatory disorder associated with rheumatoid arthritis and characterized by dryness of the mucous membranes. May have an autoimmune or genetic etiology.
spondylitis	Inflammation of one or more vertebrae. sprain Injury to a ligament that occurs when a joint is moved outside its normal range of motion but not far enough to cause dislocation or fracture.
spur	Abnormal bone formation at the edges of joints. Characteristic of conditions such as osteoarthritis.

strain	Injury to connective tissue, usually muscle, caused by overuse or improper use.
swelling around joints	Enlargement around a joint caused by excess accumulation of fluid.
systemic lupus erythematosus (SLE)	Chronic inflammatory disease of connective tissue. May affect the joints, kidneys, blood vessel walls, and skin. Cause is unknown, but may have an autoimmune mechanism.
talipes	Any deformity of the foot that involves the talus, the bone that articulates with the tibia and fibula to create the ankle joint. Also called <i>club foot</i> .
tendonitis	Inflammation of a tendon. Also called <i>tendinitis</i> .

DIAGNOSTIC PROCEDURES

Test	Description
alkaline phosphatase (ALP) test	The level of alkaline phosphatase in serum is measured. Elevated levels may indicate bone disease.
antinuclear antibody test (ANA)	Blood sample is tested for antinuclear antibodies using an indirect fluorescence antibody (IFA) test. If the IFA test is positive, the IFA pattern is reported and the serum titered. Positive results can be indicative of systemic lupus erythematosus (SLE), scleroderma, Sjogren syndrome, or Raynaud disease.

arthrography	Radiopaque contrast medium is injected into a joint such as the knee, and x-rays are taken to determine any structural abnormalities.
arthroscopy	A joint is visually examined by inserting an arthroscope through a small incision. Can be used to differentiate acute or chronic disorders, assess damage, obtain tissue for biopsy, and remove tissue or material that is causing problems. Primarily used to examine the knee. biopsy (aspiration) of
bone marrow aspiration	A needle is inserted into a bone cavity, and bone marrow is extracted (aspirated) for microscopic examination. The most common biopsy site is the superior iliac crest of the pelvic bone. This biopsy can be useful in evaluating various malignancies, blood disorders, and infectious diseases.



biopsy of muscle tissue	Sample of muscle tissue is taken, usually surgically, and examined microscopically.
blood test	Blood sample is tested for elevated levels of certain types of proteins and antibodies, which can suggest inflammation or autoimmune processes.
bone scan	A bone-seeking radioactive tracer is injected into the body. A scanner is used to generate an image of the bones. Abnormal areas typically appear lighter or darker than normal areas. This test is used to detect lesions, fractures, and malignancies. Many disorders can be detected by this procedure but not differentiated.
calcium test, serum	The level of calcium in serum is measured. Above normal levels may be indicative of certain types of cancers. Below normal levels may indicate depletion of bone mineral content, which can lead to osteoporosis and pathologic fractures.

creatine kinase (CK)	The level of CK enzyme in serum is measured. Elevated levels may indicate cardiac or skeletal muscle damage.
CT (computed tomography) of a structure in the musculoskeletal system	A computer-generated reconstruction of a specific area is created from a series of x-ray images taken as cross-sectional views of that area. These images (CT scans) are particularly useful in identifying tumors and lesions within bone.
dual-energy x-ray absorptiometry (DEXA)	X-ray technique used to determine the density of any bone with minimal radiation. Used to screen for osteoporosis in high-risk individuals. Also called <i>dual x-ray absorptiometry (DXA)</i> .
electromyography (EMG)	Needle electrodes are inserted into muscle tissue. An oscilloscope records the electrical activity from the muscle. Used to test for

	muscle disorders and injury. Can be helpful in differentiating between muscle and nerve problems.
erythrocyte sedimentation rate (ESR)	The distance (in mm) that red blood cells settle in a test tube after exactly 1 hour is measured. Elevated values are associated with inflammatory conditions (e.g., polymyalgia rheumatica), collagen diseases (e.g., SLE), infections, tumors, anemia, and other disorders that alter plasma proteins.

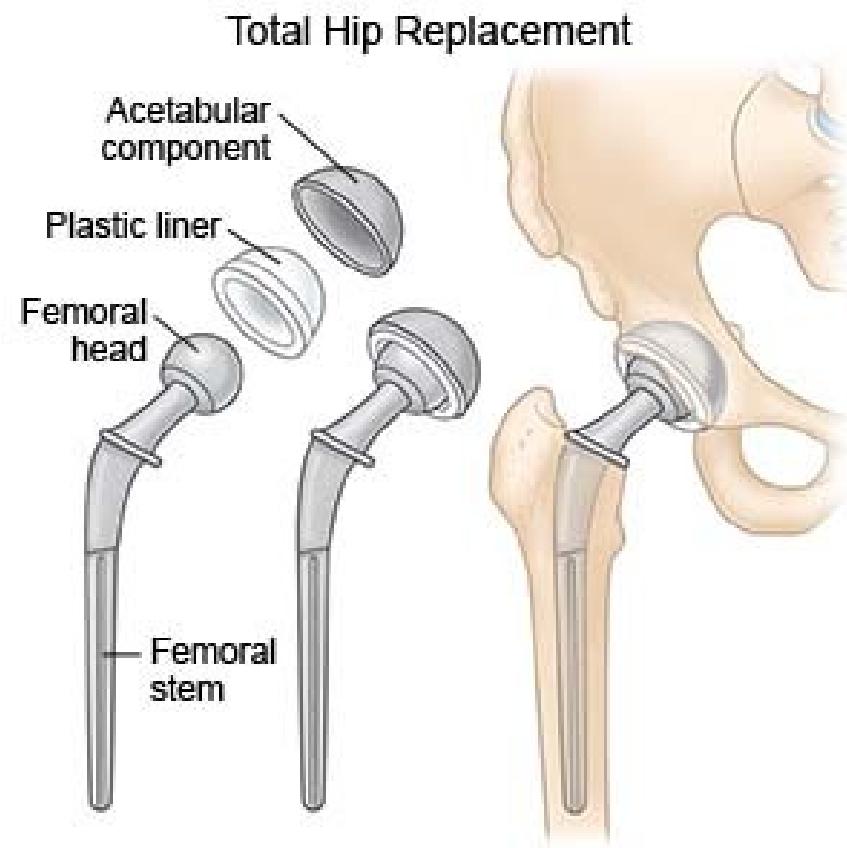
MRI (magnetic resonance imaging) of a structure in the musculoskeletal system

radiography of a musculoskeletal structure

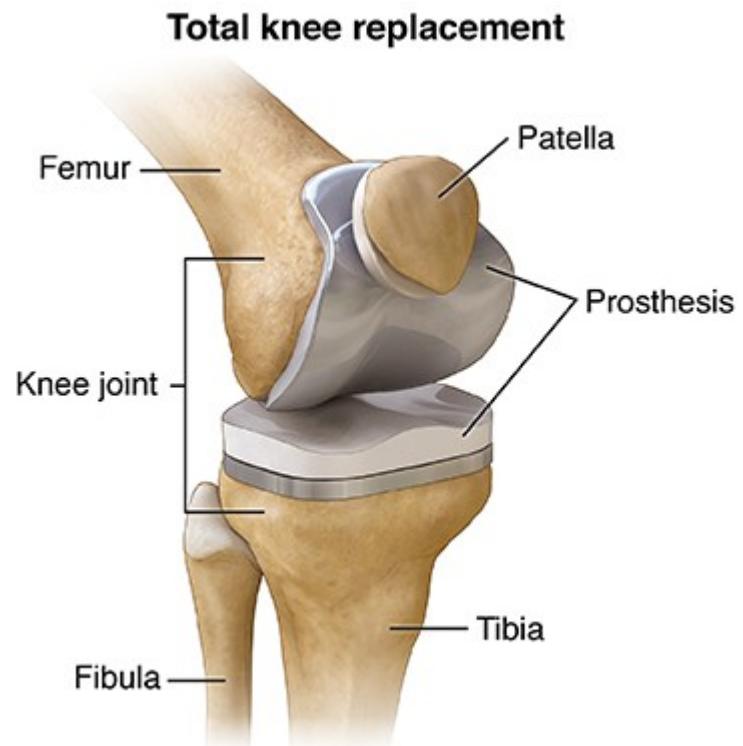
rheumatoid factor (RF) ➤ Serum is tested for the presence of the antibodies referred to as rheumatoid factors

synovial fluid examination	A needle is used to aspirate synovial fluid from a joint (a procedure called <i>arthrocentesis</i>). The fluid is viewed with the naked eye for viscosity, color, and clarity. Laboratory examination is performed to determine pH, glucose level, white blood count (WBC), and polymorphonuclear (PMN) leukocyte percentage. Microscopic examination can determine presence of crystals. A culture can be performed to determine presence of bacteria. Various results can indicate noninflammatory, inflammatory, septic, or hemorrhagic disorders.
uric acid test	Blood sample is examined microscopically to determine the uric acid level. Elevated level is indicative of gout.

THP



TKR



TERMS

SUFFIX	MEANING	TERMINOLOGY	MEANING
-desis	to bind, tie together	arthrodesis _____ <i>Bones are fused across the joint space by surgery (artificial ankylosis). This operation is performed when a joint is very painful, unstable, or chronically infected.</i>	
-stenosis	narrowing	spinal stenosis _____ <i>Narrowing of the neural (spinal) canal in the lumbar spine. Symptoms (pain, paresthesias, urinary retention, bowel incontinence) come from compression of the cauda equina (nerves that spread out from the lower end of the spinal cord like a horse's tail). See Figure 15-20.</i>	

SUFFIX	MEANING
-blast	embryonic or immature cell
-clast	to break
-listhesis	slipping
-malacia	softening
-physis	to grow
-porosis	pore, passage
-tome	instrument to cut

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
ankyl/o 	stiff	<u>ankylosis</u> _____	
arthr/o	joint	<u>arthroplasty</u> _____ <i>Replacement arthroplasty is replacement of one or both bone ends by a prosthesis (artificial part) of metal or plastic. See page 618. Carpometacarpal arthroplasty is a treatment for arthritis in the thumb (at the basal joint).</i>	

articul/o	joint	<u>articular</u> cartilage _____ <i>Inflammation of articular cartilage is arthritis, whereas a “torn cartilage” is specifically a tear of a meniscus.</i>
burs/o	bursa	<u>bursitis</u> _____ <i>Causes of this periarticular condition may be related to stress placed on the bursa or to diseases such as gout or rheumatoid arthritis. The bursa becomes inflamed and movement is limited and painful. Intrabursal injection of corticosteroids and also rest and splinting of the limb are helpful in treatment.</i>
chondr/o	cartilage	<u>achondroplasia</u> _____ <i>This is an inherited condition in which the bones of the arms and legs fail to grow to normal size because of a defect in cartilage and bone formation. Dwarfism results, characterized by short limbs and a normal-sized head and trunk. See page 80.</i> <u>chondroma</u> _____
		<u>chondromalacia</u> _____ <i>Chondromalacia patellae is a softening and roughening of the articular cartilaginous surface of the kneecap, resulting in pain, a grating sensation, and mechanical “catching” behind the patella with joint movement.</i>
ligament/o	ligament	<u>ligamentous</u> _____

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
rheumat/o	watery flow	<u>rheumatologist</u> _____ <i>Various forms of arthritis are marked by collection of fluid in joint spaces.</i>	
synov/o	synovial membrane	<u>synovitis</u> _____	
ten/o	tendon	<u>tenorrhaphy</u> _____ <u>tenosynovitis</u> _____ <i>Synov/o here refers to the sheath (covering) around the tendon.</i>	
tendin/o	tendon	<u>tendinitis</u> _____ <i>Also spelled tendonitis.</i>	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
fasci/o	fascia (forms sheaths enveloping muscles)	<u>fasciotomy</u> _____ <i>Fascia is cut to relieve tension or pressure on muscles. See Figure 15-32.</i>	
fibr/o	fibrous connective tissue	<u>fibromyalgia</u> _____ <i>Chronic pain and stiffness in muscles, joints, and fibrous tissue, especially of the back, shoulders, neck, hips, and knees. Fatigue is a common complaint. Cause is unknown, and treatment includes physical therapy, stress relief methods, and medications such as Cymbalta (duloxetine) and Lyrica (pregabalin).</i>	
leiomy/o	smooth (visceral) muscle that lines the walls of internal organs	<u>leiomyoma</u> _____ <u>leiomyosarcoma</u> _____	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
my/o	muscle	<u>myalgia</u> _____	
		<u>electromyography</u> _____	
		<u>myopathy</u> _____	
myocardi/o	heart muscle	<u>myocardial</u> _____	
myos/o	muscle	<u>myositis</u> _____	
plant/o	sole of the foot	<u>plantar flexion</u> _____	
rhabdomy/o	skeletal (striated) muscle connected to bones	<u>rhabdomyoma</u> _____	
		<u>rhabdomyosarcoma</u> _____	
sarc/o	muscle and flesh	<u>sarcopenia</u> _____	<i>Loss of muscle mass and strength associated with aging. Exercise and strength training can help preserve and enhance muscle mass at any age.</i>

SUFFIX	MEANING	TERMINOLOGY	MEANING
-asthenia	lack of strength	my <u>asthenia</u> gravis _____ <i>Muscles lose strength because of a failure in transmission of the nervous impulse from the nerve to the muscle cell.</i>	
-trophy	development, nourishment	at <urophy< u=""> _____ <i>Decrease in size of an organ or tissue.</i></urophy<>	
		hypertrophy _____ <i>Increase in size of an organ or tissue.</i>	
		amy <u>otrophic</u> _____ <i>In amyotrophic lateral sclerosis (Lou Gehrig disease), muscles deteriorate (paralysis occurs) as a result of degeneration of nerves in the spinal cord and lower region of the brain.</i>	

PREFIX	MEANING	TERMINOLOGY
ab-	away from	<u>ab</u> duction _____ <i>Duct/o means to lead.</i>
ad-	toward	<u>add</u> uction _____
dorsi-	back	<u>dorsi</u> flexion _____

PREFIX	MEANING		
poly-	many, much	calc/o, calci/o	calcium
		kyph/o	humpback, hunchback (posterior curvature in the thoracic region)
		lamin/o	lamina (part of the vertebral arch)
		lord/o	curve, swayback (anterior curvature in the lumbar region)

lumb/o

loins, lower back

myel/o

bone marrow

orth/o

straight

oste/o

bone

acetabul/o

acetabulum (hip socket)

calcane/o

calcaneus (heel)

carp/o

carpals (wrist bones)

scoli/o

crooked, bent
(lateral curvature)

spondyl/o (used to make words about conditions of the structure)

vertebr/o (used to describe the structure itself)

vertebra

vertebra

clavicul/o	clavicle (collar bone)	ili/o	ilium (upper part of pelvic bone)
cost/o	ribs (true ribs, false ribs, and floating ribs)	ischi/o	ischium (posterior part of pelvic bone)
crani/o	cranium (skull)	malleol/o	malleolus (process on each side of the ankle)
femor/o	femur (thigh bone)	mandibul/o	mandible (lower jawbone)
fibul/o	fibula (smaller lower leg bone)	maxill/o	maxilla (upper jawbone)
humer/o	humerus (upper arm bone)		

metacarp/o	metacarpals (hand bones)
metatars/o	metatarsals (foot bones)
olecran/o	olecranon (elbow)
patell/o	patella (kneecap)
pelv/i	pelvis (hipbone)

perone/o 

fibula

phalang/o

phalanges (finger
and/or toe bones)

pub/o

pubis (anterior
part of the pelvic
bone)

radi/o

radius (forearm
bone—thumb
side)

scapul/o

scapula (shoulder
blade)

stern/o

sternum
(breastbone)

tars/o

tarsals (bones of
the hindfoot)

tibi/o

tibia (shin bone)

uln/o

ulna (forearm
bone—little
finger side)

ABBREVIATION

Abbreviation	Meaning
AE	above the elbow (amputation)
AK	above the knee (amputation)
ALP	alkaline phosphatase
ANA	antinuclear antibody (test)
BE	below the elbow (amputation)
BK	below the knee (amputation)
C1 through C7	abbreviations for 7 cervical vertebrae
CDH	congenital dislocation of the hip
CK	creatine kinase
CTS	carpal tunnel syndrome
DEXA	dual-energy x-ray absorptiometry
DJD	degenerative joint disease
DLE	discoid lupus erythematosus
DXA	dual x-ray absorptiometry
EMG	electromyography

ESR	erythrocyte sedimentation rate
Fx, fx	fracture
HD	hip disarticulation
HNP	herniated nucleus pulposus (herniated disk)
IS	intercostal space
KD	knee disarticulation
L1 through L5	abbreviations for 5 lumbar vertebrae
LD	lactic acid dehydrogenase
NSAID	nonsteroidal anti-inflammatory drug
OA	osteoarthritis
ortho, ORTH	orthopedics

RA	rheumatoid arthritis
RF	rheumatoid factor
ROM	range of motion
S1 through S5	abbreviations for 5 sacral vertebrae
SD	shoulder disarticulation
SLE	systemic lupus erythematosus
SS	Sjogren syndrome
T1 through T12	abbreviations for 12 thoracic vertebrae
THA	total hip arthroplasty
THR	total hip replacement
TKA	total knee arthroplasty
TKR	total knee replacement
TMJ	temporomandibular joint

THANK YOU