

# Skeletal System Notes

## A. Introduction

1. Skeletal system is made of organs that are called bones
2. In the adult, there are 206 bones

## B. Functions of bones

1. Framework: support the body's muscle fat, and skin.
2. Protection
  - a. Surround vital organs to protect them
  - b. Examples
    - (1.) Skull that surrounds brain
    - (2.) Ribs that protect heart and lungs.
3. Levers: attach to muscles to help provide movement
4. Produce blood cells: produce red and white blood cells and platelets.
5. Storage: store most of calcium supply blood

## C. Parts of long bones

1. Long bones are bones of extremities (arms and legs)
2. Diaphysis: long shaft
3. Epiphysis: two extremities or ends
4. Medullary canal
  - a. Cavity in diaphysis
  - b. Filled with yellow marrow
5. Yellow marrow
  - a. Inside medullary canal
  - b. Mainly fat cells
6. Endosteum
  - a. Membrane that lines medullary canal
  - b. Keeps the yellow marrow intact
  - c. Produces some bone growth
7. Red marrow
  - a. Found in certain bones such as vertebrae, ribs, sternum, cranium, and proximal ends of humerus and femur
  - b. Produces red blood cells platelets, and some white blood cells
  - c. Bone marrow is important in the manufacture of blood and is involved with the body's immune systems.
    - (1.) Used in diagnosing blood diseases
    - (2.) Given as transplants to people with defective immune systems
8. Periosteum
  - a. Tough membrane covering outside of bone
  - b. Contains blood and lymph cells
  - c. Contains osteoblasts: special cells that form new bone tissue.
  - d. Necessary for bone growth, repair, and nutrition
9. Articular cartilage
  - a. Thin layer covers the epiphysis
  - b. Acts as a shock absorber when two bone meet to form a joint

D. Two section of skeleton

1. Axial skeleton
  - a. Forms main trunk of the body
  - b. Composed of the skull, spinal column, ribs, and sternum
2. Appendicular skeleton
  - a. Forms extremities (arms and legs)
  - b. Composed of shoulder girdle, and leg bones

E. Skull

1. Composed of cranium and facial bones
2. Cranium
  - a. Round structures that surrounds and protects the brain
  - b. Made of eight bones
    - (1.) Frontal
    - (2.) Two parietal
    - (3.) Two Temporal
    - (4.) Occipital
    - (5.) Ethmoid
    - (6.) Sphenoid
  - c. At birth, the cranium is not solid bone
    - (1.) Spaces called fontanel or "soft spots" allows for the enlargement of the skull as brain growth occurs**
    - (2.) Frontal are made up of membrane and
    - (3.) Turn into solid bone by about 18 months of
3. Facial bones
  - a. Fourteen facial bones
  - b. Main bones
    - (1.) Mandible: Lower jaw
    - (2.) Maxilla: two bones forming upper jaw
    - (3.) Zygomatic: two cheek bones
    - (4.) Nasal: five bones in upper part of nose
    - (5.) Palatine: two bones of hard palate on roof of mouth
4. Sutures: area where cranial bones have joined together
5. Sinuses
  - a. Air space in the bones of the skull
  - b. Provide strength with less weight
  - c. Act as resonating chambers for voice
  - d. Lined with mucous membranes
6. Foramina
  - a. Opening in bones
  - b. Allow nerves and blood vessels to enter or leave bone

cartilage

age

## F. Vertebrae

1. Spinal column made of 26 bones called vertebrae
2. Protect the spinal cord
3. Provide support for head and trunk
4. Main sections
  - a. Cervical: 7 neck vertebrae
  - b. Thoracic: 12 vertebrae in back of chest, attaches to ribs
  - c. Lumbar: 5 vertebrae by wrist
  - d. Sacrum: 1 large vertebrae on back of pelvic girdle
  - e. Coccyx: 1 fused vertebrae called tailbone
5. Intervertebral disks
  - a. Pads of cartilage tissue that separate vertebrae
  - b. Act as shock absorbers
  - c. Permit bending and twisting movements of vertebral column

## G. Ribs or costae

1. 12 pairs of long slender bones
2. Attach to thoracic vertebrae on dorsal surface of body
3. True ribs
  - a. First 7 pairs of ribs
  - b. Attach directly to sternum on front of body
4. False ribs
  - a. Next pairs of ribs
  - b. First 3 pairs attach to cartilage of rib above
  - c. Floating ribs
    - (1.) Last two pairs of false ribs
    - (2.) No attachment on front of body

## H. Sternum

1. Breastbone
2. Consist of three parts
  - a. Manubrium or upper region
  - b. Body or center area
  - c. Xiphoid process: small piece of cartilage at bottom
3. Two clavicles attach to the manubrium by ligament
4. Ribs attach to sternum with costal cartilages to form a cage that protects the heart and lungs

## I. Shoulder or pectoral girdle

1. Two clavicles or collarbone
2. Two scapulas (scapulae) or shoulder bones
3. Scapula provides for attachment of upper arm bone

## J. Bones of the arm

1. Humerus: upper arm bone
2. Radius: lower arm bone on thumb side
3. Ulna: larger bone of lower that contain protection called the olecranon process at upper end forming elbow
4. Carpals: 8 wrist bones on each hand
5. Metacarpals: 5 bones on each hand to form palm
6. Phalanges: 14 bones on each hand to form thumb fingers

## K. Bones of pelvic girdle

1. Made of two os coxae (coxal or hip bone)
2. Join with sacrum on dorsal part of body
3. Join together at a joint called the symphysis pubis on ventral part of body
4. Each os coxae made of three bones that are fused or joined
  - a. Ilium
  - b. Ischium
  - c. Pubis
5. Contains two recessed areas or sockets called acetabulums that provide for attachment of bones of the legs
6. Obturator foramen
  - a. Opening between the ischium and pubis
  - b. Allows for passage of nerves and blood vessels to form the legs

## L. Bones of the legs

1. Femur: Thigh bone
2. Patella: Kneecap
3. Tibia: Long supporting bone of lower leg, medial surface
4. Fibula: smaller bones of lower leg, lateral surface
5. Tarsals: 7 bones of ankles, calcaneus is heel bone
6. Metatarsals: 5 bones forming instep of foot
7. Phalanges: 14 bones on each foot, form toes

## M. Joints

1. Areas where two or more bones join together
2. Ligaments: connective tissue bands that hold long bones together
3. Three main types of joints:
  - a. Diarthrosis
    - (1.) Freely movable
    - (2.) Ball-and-sockets joints of the shoulder and hip
    - (3.) Hinge joints of the elbow and knee
  - b. Amphiarthrosis
    - (1.) Slightly movable
    - (2.) Example is the vertebrae
  - c. Synarthrosis
    - (1.) Immovable
    - (2.) Example is the cranium

## N. Diseases of skeletal system

1. Arthritis
  - a. Group of diseases involving an inflammation of the joints
  - b. Two main types: osteoarthritis and rheumatoid arthritis
  - c. Osteoarthritis
    - (1.) Chronic disease that occurs with aging
    - (2.) Symptoms: joint pain, stiffness, aching, limited range of motion
    - (3.) Treatment: rest, heat/cold applications, aspirin, anti-inflammatory medications, steroid injections, special exercises
  - d. Rheumatoid arthritis
    - (1.) Chronic inflammatory disease of connective tissues and joints
    - (2.) Three times more common in women
    - (3.) Often begins between ages of 35 and 45

- (4.) Progressive attacks cause scars tissue formation and atrophy of bones and muscle tissue, which results in permanent deformity and immobility
  - (5.) Treatment:
    - aa. Rest and prescribe exercise
    - bb. Anti-inflammatory medications:
    - cc. Surgery, or arthroplasty, to replace damaged joints such as hip or knees
2. Bursitis
    - a. Inflammation of bursae, small fluid-filled sacs surrounding joints
    - b. Frequently affects shoulders, elbows, hip, or knees
    - c. Symptoms: severe pain, limited movement, accumulation of fluid in joint
    - d. Treatment
      - (1.) Pain medications and rest
      - (2.) Injections of steroids and anesthetics into joint
      - (3.) Aspiration (withdrawal of fluid with a needle) of joint
      - (4.) Physical therapy to preserve joint motion
  3. Fractures
    - a. Involve a crack or break in a bone
    - b. Types of fractures
      - (1.) Greenstick: bone is bent and splits causing a crack or incomplete break; common in children
      - (2.) Simple: complete break with no damage to the skin
      - (3.) Compound: break in bones that ruptures through skin; increased chance of infection
      - (4.) Impacted: broken bones ends jam into each other
      - (5.) Comminuted: bone fragment or splinters into more than two pieces
      - (6.) Spiral: severe twisting of the bone causes one or more breaks; coming in skiing and skating accidents
      - (7.) Depressed: broken piece of skull bone moves inward; common with severe head injuries
      - (8.) Colles: breaking and dislocation of distal radius that causes a characteristic bulge at the wrist; caused by falling on an outstretched hands
    - c. Reduction
      - (1.) Process by which bone is put back into proper alignment
      - (2.) Closed reduction; position bone in alignment, usually with traction, and apply cast or splint to maintain position
      - (3.) Open reduction; surgical repair of bone, and times, insertion of pins, plates and other devices
  4. Dislocation
    - a. Bone is forcibly displaced from a joint
    - b. Frequently occurs in shoulders, fingers, knees, and hips
    - c. Reduced and immobilized with splint, cast, or traction
  5. Sprain
    - a. Twisting action tears ligaments at a joint
    - b. Common sites are wrists and ankles
    - c. Symptoms: pain, swelling, discoloration, limited movement
    - d. Treatment
      - (1.) Rest and elevation
      - (2.) Immobilization with elastic bandages or splint
      - (3.) Cold applications
  6. Osteomyelitis
    - a. Inflammation of bone usually caused by pathogenic organism
    - b. Pathogens causes formation of abscess within bone and accumulation of pus in medullary canal
    - c. Symptoms: pain at site, swelling, chills, fever
    - d. Treatment is antibiotics for infection