# Bone Growth and Articulation Notes

**MMHS** Science

#### **Bone Formation**

 Known as "Ossification" or "Osteogenesis" (=bone creation).

Two Types of Embryonic Ossification:

- 1. Intramembranous Ossification
- 2. Endochondral Ossification

#### **Intramembranous Ossification**

<u>LOCATION</u>: Occurs in flat bones like ribs and the plates of the skull. (=Epiphysis Formation)

- 1. Begins with the formation of connective tissue "sheets" in late embryonic development.
- 2. These sheets are highly vascularized and form osteoblasts on the interior.
- 3. The osteoblasts turn into osteocytes, thus forming the spongy bone.
- 4. The remaining CT "sheets" are layed down to form the Periosteum.
- 5. The newer osteoblasts accumulate on the edge of the spongy bone and then create the compact bone.

#### **Order of Bone Formation**



#### Spongy Bone > Periosteum >

**Compact Bone** 

#### Intramembranous Growth



#### **Endochondral Ossification**

Location: Long, short & Irregular Bones (=Diaphysis Formation)

- 1. Chondrocytes swell up and begin to die.
- 2. Periosteum forms along the outside of the cartilage.
- 3. Osteoblasts invade the P.O.C (Primary Ossification Center) in the diaphysis turning into osteocytes.
- 4. Next, chondrocytes die in the epiphyses, osteoblasts invade the S.O.C (Secondary Ossification Center) turning into osteocytes.
- 5. The P.O.C and S.O.C never merge and are left with cartilage inbetween the 2 regions.
- 6. This remaining cartilage becomes the Epiphyseal Plate or "Growth Plate" where new cells are layed down.

#### **Endochondral Growth**



#### Bone Growth





#### **Bone Growth**

- <u>Two Types</u>
- 1. Length-Wise (=Oppositional Growth)
- 2. Diameter/Width (=Appositional Growth)

## **Oppositional Growth**

- Chondrocytes in the epiphyseal plate divide (via Mitosis).
- 2. They are repaced by bone on the diaphysis side of the plate.
- 3. When growth stops, cartilage in the epiphyseal plate is replaced by bone (osteocytes).
- 4. Osteocytes then lay down the calcified matrix (=calcification)

## **Appositional Growth**

- 1. Bone around medullary cavity is destroyed.
- 2. More yellow marrow moves into the void and fills the space.
- 3. The periosteum adds new bone to the outside.

## **Appositional Growth**



## Articulations (=Joints)

- <u>4 Main Categories of Joints</u>
- 1. Immovable
- 2. Fibrous
- 3. Cartilaginous
- 4. Synovial

### 1. Immovable Joints

- No movement
- <u>Example</u>: The plates of the skull that form the cranial sutures.



### 2. Fibrous Joints

Slight movement in the joint. Dense connective tissue holds bones together. Forms Interosseus membrane. Example: Ulna/Radius Tibia/Fibula

## Fibrous Joint



### 3. Cartilaginous Joint

 Formed by Hyaline or Fibrocartilage.
 <u>Examples</u>: Intervertebral disks (Vertebra) Costal Cartilage (Ribs) Symphysis Pubis (Pubic Bone)

## 3. Cartilaginous Joints



## 4. Synovial Joints

- The most "movable" joints in the body.
- Membrane secretes synovial fluid in the joint.
- Fluid used for lubrication.
- Fluid is produced by the bursa sack.
- Bone ends have articular (hyaline) cartilage.

## Synovial Joints



## **Types of Synovial Joints**

\*\*\*Types of Synovial Joints (write chart underneath notes on ISN-43).\*\*\*

Type of Synovial Joint	Location Found in Body
1. Ball and Socket	Hip; Shoulder
2. Condylloid	Phallanges (fingers/toes)
3. Hinge	Knee; Elbow
4. Pivot	Radius/Ulna
5. Saddle	Artic. b/w Thumb + Metacarpal.
6. Gliding	Wrist or ankle

ANS = Hinge



ANS = Saddle



ANS = Hinge



ANS = Ball and Socket

Acetabulum (hip socket) Femoral head ball) Femur (thigh bone)

ANS = Gliding





ANS = Gliding

## **Bone Terminology**

- 1. Bumps on Bones
- 2. Depressions on Bone
- 3. Holes in Bones

#### 1. Bumps on Bones

Process = projections Condyle = rounded smooth projections Epicondyle = above a condyle. Spine = thorn-like, elevated projection. Tubercle = knob-like process Tuberosity = large, rough tubercle. Trochanter = large, rough tuberosity.

#### 2. Depressions on Bones

Facet = flat area that articulates (on vertebrae)
Fossa = shallow indentation (scapula)



#### 3. Holes in Bones

- Foramen = holes for blood vessels, nerves, and ligaments.
- Meatus = bony tube (opening for ear)
- Sinus Cavity = space filled with air



 Left maxillary sinus 

 Auditory
 Glenoid

 Matiory
 Glenoid

 Toganatic arch
 Toganatic arch

 Mastoid
 Head of

 process
 Head of

 process
 Coronoid

#### Sinus

