

II. JOINTS

I. General Aspects

- A. Articulations (artic, to join + -ul-, a little + -ation, act or state of...) or "Joints", when two or more bones come together in close proximity for the purpose of stability or possible motion
- B. Usually 206 bones in the adult body; Formation of bones in the developing individual **Embryo** vs. **Fetus**
 - 1. Embryo (Embry-, "full of life") - the developing individual from the Zygote (Zyg-, yolk) (or fertilized egg) to the end of the 8th week of development
 - 2. Fetus (Fet-, "Little Man") - the developing individual from the end of the 8th week of development to birth (= **Parturition**)
- C. There can be fewer or more due to genetics and disease; especially Sesamoid (Sesam-, pea + -oid-, resemblance) bones embedded in muscle tendons for strengthening the tendons; 2 at distal end 1st Metacarpel of hand palmarly; 2 at distal end 1st Metatarsel of foot plantarly

II. Joints are classified by taking into account: **1. Structural Classes of Joints** (based upon the kind of connective tissue that binds or holds together the bones of the joint, and **2. Functional Classes of Joints** (based upon how much motion is possible as the joint moves

A. Kind of connecting medium (= **Structural Classes of Joints**)

- 1. Fibrous Joints (held together by approx. 70% Collagenous or "White" fibers; 30% Elastic or "Yellow" fibers); e.g. Suture joints
- 2. Cartilaginous – piece or pad of cartilage holds bones of joint together; e.g. Intervertebral disks
- 3. Synovial (syn, together + ov, egg = eggwhite) - distinct cavity present between bones of joint; held together by capsule and ligaments (= Extracapsular ligaments); e.g. Knee joint

B. Degrees of motion possible (= **Functional Classes of Joints**)

- 1. Synarthroses (syn-, together + arthr-, joint + -ose, characterized by...); e.g. Sutures of cranial bones; Tortora & Grabowski et al call them **immobile** joints; Are they actually immobile? Can there be slight motion? What does the presence of Elastic fibers in sutures mean? Can the pulsing pressure of **Cerebrospinal Fluid** ("CSF") move the cranial bones?
- 2. Amphiarthroses (amphi-, both); slight to moderate amount of movement is possible
- 3. Diarthroses (di-, two); highly or freely moveable

III. Fibrous joints (See Fig. 9.1 on Text Page 229)

- A. Sutures (See also Fig. 7.31 & 9.2); e.g. between the Cranial bones; **Synarthroses?**
- B. Syndesmoses (**-desm**, to join); e.g. between Tibia (medial bone of leg) and Fibula (lateral bone of leg distally); **Amphiarthroses**
- C. Gomphoses (**Gompho**; a nail); between a tooth and its **Alveolar** (**alveol**, space or hollow) **border**; of maxilla or mandible; Synarthroses?

IV. Cartilaginous (**cartilag**, gristle) joints (See Fig. 9.3 on Text Page 230)

- A. Synchondroses (**chondr**, cartilage); formed of Hyaline cartilage, e.g., fetal or developing bones; Tortora & Grabowski call them Synarthroses; may actually be Amphiarthroses

- 1. Diaphysis (**Dia**-, through + **phys**-, to nourish) – shaft part of a long bone
- 2. Epiphysis (**Epi**-, On, Upon + **phys**-, to nourish) - enlarged end of a long bone; can have 2, one on each end (Proximal and Distal epiphysis), or on just one end, usually the proximal end
- 3. Epiphyseal Plate – area of Hyaline cartilage that persists between Diaphysis and Epiphysis until late teen years of age

(a) Epiphyseal plates can be used for dating the age of the individual

(1) Epiphyseal plate “**open**” (not ossified yet); (**ossi**-, bone + **fi**-, to make)

(2) Epiphyseal plate “**closed**” (ossified)

(b) Baby usually do not break bones; Epiphyseal plate allows movement on impact; Movement creates Heat; Body uses the heat or gets rid of it

- 4. Synchondroses persist into adulthood as the Intercostal (**inter**, between + **cost**, rib) cartilages (See Fig. 9.3[a,b]); Synarthroses? Normal respiration; Cardiopulmonary Resuscitation (“CPR”)

- B. Symphyses (**sym**, together + **phys**-, to grow); formed of Fibrocartilage; Amphiarthroses

1. Pubic symphysis (See Fig. 9.3[b])- pad between pubic bones

2. Intervertebral discs (See Fig. 7.22 & 9.3[c]) with:

(a) **Nucleus annulus** – Collagenous fibers (connect neighboring **Vertebral bodies**) and Elastic fibers (Allow motion)

(b) *Nucleus pulposus* - Shock absorption during weight bearing

3. Intervertebral discs can transfer stress from one side of body to the other; ***Herniation of Disk*** (“Slipped Disk”); Psoas major muscle and rotation of Femur (See **Handout C**)

V. Synovial joints (*Diarthroses*) (See Fig. 9.4 on Text Page 231)

A. Features

1. Presence of a synovial cavity; empty except in knee and sternoclavicular joints occupied by a pad of ***Fibrocartilage***
2. Articular cartilage; thin layer of ***Hyaline cartilage***
3. Articular or ***Synovial capsule***; or "capsule" (***caps, purse***); includes an outer ***Fibrous capsule*** made of Dense regular connective tissue for binding strength, and an inner ***Synovial membrane*** (made of Loose connective tissue) which produces lubricating fluid
4. Synovial fluid or **Synovium**
5. Extracapsular (**extra**, *outside of...*) ligaments; formed of dense regular connective tissue, these fuse to underlying capsule; usually paired (a ***Medial collateral*** and ***Lateral collateral ligament***), but in triads in shoulder and hip joints, e.g. Glenoacromial and Pubofemoral ligaments
6. Intracapsular (**intra**, *inside of...*) ligaments - only in knee and hip; ***Anterior*** and ***Posterior cruciate ligaments of knee*** (See Fig. 9.19) ; and ***Round ligament of hip*** (See Fig. 9.18[c,d])
7. Menisci (singular = Meniscus); ***Medial*** and ***Lateral***; only in knee, C-shaped pads of fibrocartilage to receive the femoral condyles (**condyl**, *knuckle*)

B. Types of synovial joints (refer to **Handout D** and Fig. 9.6 on Text Page 233)

1. Gliding or plane
2. Hinge
3. Pivot
4. Ellipsoidal or condyloid
5. Saddle
6. Ball-and-socket or enarthroidal