Articular system I

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Articular system=Syndesmology (Systema articulare)

- System of joints
- Joint occurs, where 2 bones meet
- Combine bones of skeleton into a single unit
- Provide mobility
Classification of the joints

1. Synarthrosis (immovable joint):
   1) Synodesmosis
   2) Synchondrosis
   3) Synostosis

2. Diarthrosis (synovial joint, joint)
Classification of joints:
1. **Synarthrosis** (immovable joint)
2. **Diarthrosis** (synovial joint, joint)

- Immovable and strong connection
- No cavity
- Space between bones is filled with different types of connective tissue

1) **Syndesmosis** – solid connective tissue

2) **Synchondrosis** - cartilage

3) **Synostosis** - bone
Sutures = bone - collagenous sutural ligament - bone
Synarthrosis (immovable joint):

1) Syndesmosis
2) Synchondrosis
3) Synostosis

Serrate suture (Sutura serrata):
- Lambdoid suture
- Sagittal suture
- Coronal suture

Plane suture (Sutura plana)
- sutures between the bones of the facial skull

Squamous suture (Sutura squamosa)
- Temporo-parietal suture
Synarthrosis (immovable joint):
1) Syndesmosis
2) Synchondrosis
3) Synostosis

Functions:
a) the possibility of displacement of the skull bones during birth,
b) the possibility of bone growth of the skull after birth
**Synarthrosis**
(immovable joint):

1) Syndesmosis
2) Synchondrosis
3) Synostosis

**Interosseus membranes**

= bone – layers of parallel collagen fibers – bone

**Functions:**

a) hold the bone adjacent to each other
b) serve as an attachment site for muscles
c) forming holes to vessels and nerves
Synarthrosis (immovable joint):
1) Syndesmosis
2) Synchondrosis
3) Synostosis

Fibers of the ligaments:
- a) Fibrous
- b) Elastic (*Ligamentum flavum*)

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**Synarthrosis** (immovable joint):
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**Dento-alveolar syndesmosis**
(Gomphosis)

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**Figure 2.18. Sharpey Fibers.** The ends of the periodontal ligament fibers that are embedded in the alveolar bone and the cementum are known as Sharpey Fibers.
Synarthrosis (immovable joint):
1) Syndesmosis
2) Synchondrosis
3) Synostosis

**Synchondrosis**

= bone - hyaline/fibrous cartilage - bone

**Functions:**

a) Connection of the bones
b) Amortization
Permanent Synchondrosis

- Permanent during the whole life
- Fibrous cartilage (stronger)

Samples:
- Intervertebral discs
- Cartilage of the ribs
**Temporary Synchondrosis**

- Hyaline cartilage (more elastic)
- Later will be ossified

**Samples:**
- Sphenooccipital synchondrosis
- Sacrum
- Hip bone
- Metaphysis (growth plate of long bones)
Synarthrosis (immovable joint):
1) Syndesmosis
2) Synchondrosis
3) Synostosis

Synostosis = rigid bony union

Temporary synchondrosis

Synostosis
Symphysis
(semi-mobile joint)

= bone - hyaline cartilage - fibrocartilage disc with slit-like cavity filled with synovial fluid - hyaline cartilage – bone
**Symphysis**

**Synarthrosis** (immovable joint):
1) Syndesmosis
2) Synchondrosis
3) Synostosis

**Intervertebral symphisis**

**Pubic symphisis**
Classification of joints:
1. Synarthrosis (immovable joint)
2. Diarthrosis (synovial joint, joint)

Diarthrosis
(Synovial joint)

= bone - articular cartilage - fluid in cavity - articular cartilage - bone
Essential elements of Diarthrosis

1. **Articular surfaces** of the bones
   - covered with cartilage
2. Articular cavity
3. Articular capsule
Articular surface of Diarthrosis

**Congruence** – similarity between articular surfaces.

Less congruence - more mobility of the joint

Sacroiliac joint

Shoulder joint
Articular Discs, Meniscus and Labrum

- Articular disc
- Articular meniscus
- Articular labrum
Articular cartilage has:

- no pain receptors
- no blood vessels
- very low coefficient of friction

Hyaline cartilage
- covers articular surfaces most of the joints

Fibrous cartilage
- covers articular surfaces of two joints

Articular cartilage

- covers articular surfaces of two joints
Articular capsule

- Periosteum
- Ligament
- Articular capsule
  - Fibrous capsule
  - Synovial membrane
- Compact bone
**Synovial fluid functions:**

1) Lubricate the articular surfaces
2) Feed the articular surfaces (the cartilage has no blood vessels)
3) Combine the articular surfaces into a single unit
4) Moderate the pressure

**Synovial membrane functions:**

1) lines the joint and seals it into a joint capsule.
2) secretes synovial fluid (a clear, sticky fluid) around the joint to lubricate it.
Support elements of the joints

1. Intraarticular ligaments
   - Fibrous ligaments covered with synovial membrane

2. Intraarticular cartilage (discus/meniscus)
   - Increase the congruence of the articular surfaces

3. Articular labrum ("lips")
   - Fibrous cartilages surrounding the articular surface

4. Articular folds
   - Derivative of synovial membrane

5. Articular bursa ("sacs")
   - Cavities, lined with synovial membrane, that help cushion the friction in a joint

6. Fat pads
Ligaments of the joints

- strong ligaments (tough, elastic bands of connective tissue)

**Functions:**
1) surround the joint to give support and stability
2) connect the bones
3) limit the joint's movement
4) reinforce the articulations
5) frequently form an articular capsule about the joint
Tendons of the joints

- another type of tough connective tissue on each side of a joint
- attach to muscles that control movement of the joint.
Similarity of the articular surfaces is called:

a) Syndesmosis
b) Congruence
c) Diarthrosis
d) Symphisis
Connection of the bones through fibrous connective tissue is called:

a) Syndesmosis  
b) Synchondrosis  
c) Diarthrosis  
d) Symphysis  
e) Synostosis
Samples of permanent synchondrosis:

a) Sacroiliac joint
b) Pubic symphysis
c) Sternocostal junction
d) Sacral vertebrae junction
e) Intervertebral disc
Essential elements of the diarthrosis:

a) Articular disc
b) Articular surface
c) Articular notch
d) Articular condyle
e) Articular capsule
f) Articular ligaments
g) Articular space/cavity
Gomphosis is a sample of:

a) Syndesmosis
b) Synchondrosis
c) Diarthrosis
d) Symphysis
e) Synostosis
CLASSIFICATION OF SYNOVIAL JOINTS
Complexity of the joints

Simple joint
- two articular surfaces
- Usually: one convex, male & one concave, female

Complex joint
- more than two articular surfaces
- Presence of disc or meniscus
Synovial joints

Combined joint

- Two anatomically isolated joints move together at the same time
Shape of articular surfaces

Types of Joints

- Ball and socket joint
- Pivot joint
- Saddle joint
Shape of articular surfaces

- Hinge joint
- Elipsoidal joint
- Plane joint
Frontal axis

Flexion-extension
Sagittal axis

Abduction - adduction
Vertical axis

Rotation

* outward (supinatio)
* inward (pronatio)
Movements in all axes

Circular movement
Degrees of freedom

- Moves in one plane uniaxial (elbow)
- Moves in two planes biaxial (wrist)
- Moves in three planes multiaxial (shoulder joint)
Uniaxial joints

- cylindrical
- trochlear
- hinge
Uniaxial joints
Uniaxial hinge
Biaxial joints

Biaxial ellipsoid
Biaxial joints

Biaxial saddle
Biaxial joints

Biaxial condylar
Multiaxial joints

Multiaxial ball-and-socket
Multiaxial joints

Multiaxial scyphiform
Multiaxial joints

Multiaxial plane
What determines volume of movements in the joint?

- Congruence of articular surfaces
- Presence of discs and meniscs
- Tension of capsule
- Combination of joints
- Ligaments which strengthen the joint
- Muscles around the joint
- Synovial fluid
- Atmospheric pressure
- Extra weight
Samples of combined joint:

a) Sacroiliac joint (right and left)
b) Radio-ulnar joint (proximal and distal)
c) Temporomandibular joint (right and left)
d) Radiocarpal joint
e) Atlanto-occipital joint
f) Sternoclavicular joint
g) Knee joint
Samples of complex joint:

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