Locomotor apparatus consist of active and passive parts.

Sceleton and joints of bones is passive part.

Active part is muscles.

Arthrology is the science concerned with the study of joints.

Joints

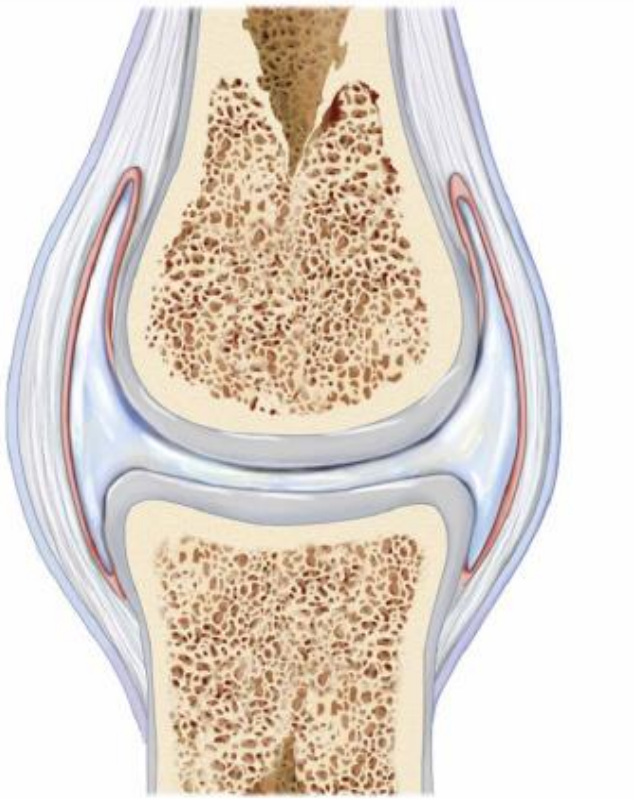
- Formed where two bones meet
- Also called an **articulation**
- Three types based on movement allowed between the 2 bones:
  - **Synovial**
  - **Cartilaginous**
  - **Fibrous**

Synovial Joints

- Freely moving joints
- Most common type of joint
- Example is ball-and-socket joint
- Bones held together by **ligaments**
  - Strong bands of connective tissue
- Some contain a **bursa**
  - Sac-like structure lined with synovial membrane

Synovial Joints

- Enclosed in an elastic **joint capsule**
- Contains **synovial fluid**
  - Lubricant secreted by **synovial membrane**
- Ends of bones are covered with **articular**



Cartilaginous Joints

- Allow slight movement
- Hold bones firmly in place by solid piece of cartilage
- Example
  - Pubic symphysis

Fibrous Joints

- Allow almost no movement
- Joined by thick fibrous tissue
- Example
  - Sutures of the skull

Classification of joints

There are two major types of joints:

- immovable joint (synarthrosis),
- movable joint (diarthrosis or articulatio (L)).

The immovable joint (synarthroses) - a bone is united directly to another bone by a very small amount of fibrous connective tissue, or cartilage tissue.

The movable joint (diarthrosis). These joints have fluid-filled joint cavities which is enclosed by a joint capsule.

The subtypes of immovable joint are the:

1. Syndesmoses.

2. Synchondroses.

3. Synostoses.

The types of syndesmoses are:

- **Sutures**
- **Ligaments**
- **Interosseous membrane**
- **Gomphoses**

1.Syndesmoses.

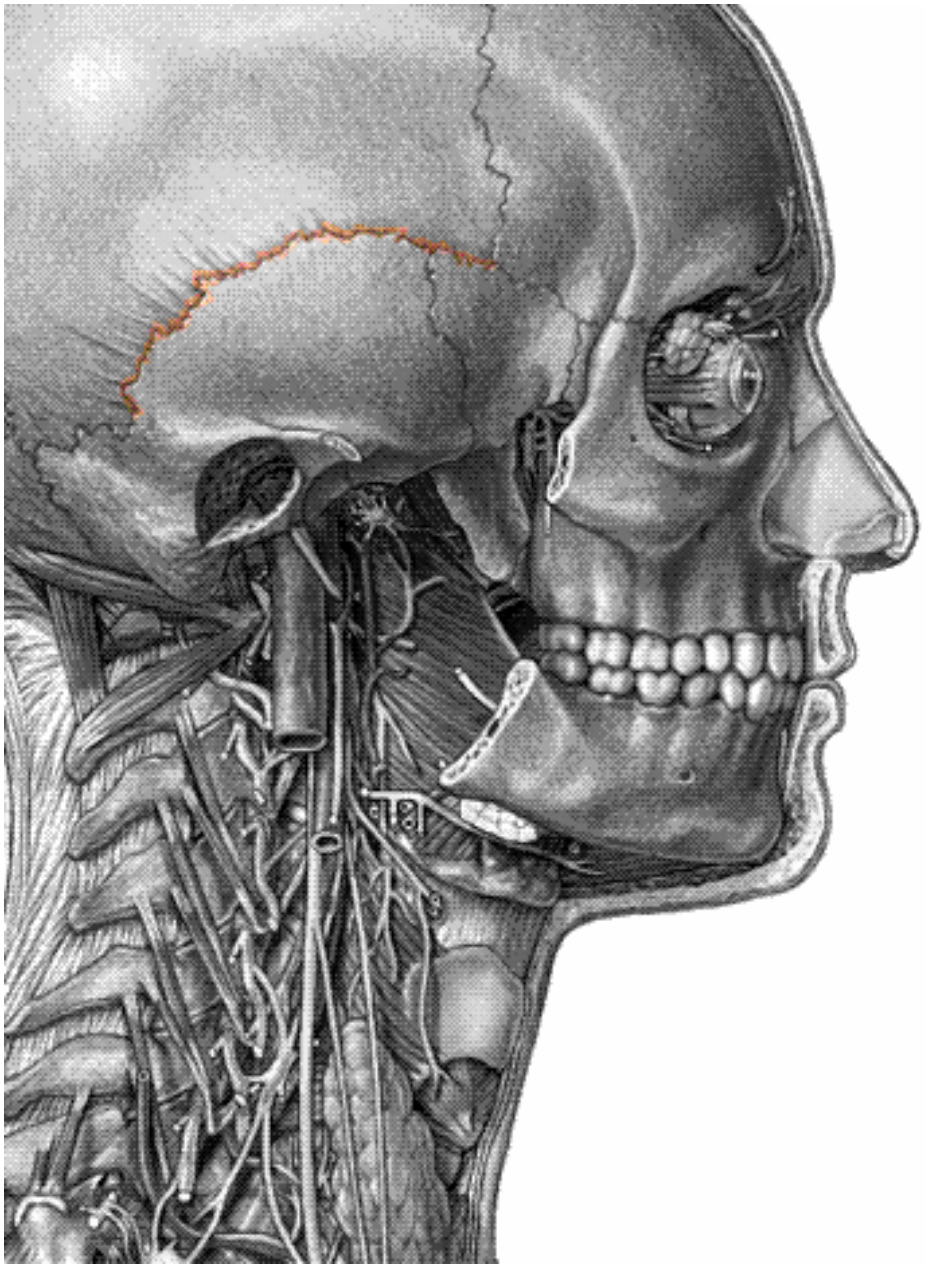
In fibrous joints, the bones are held together by fibrous connective tissue. These joints have no joint cavities.

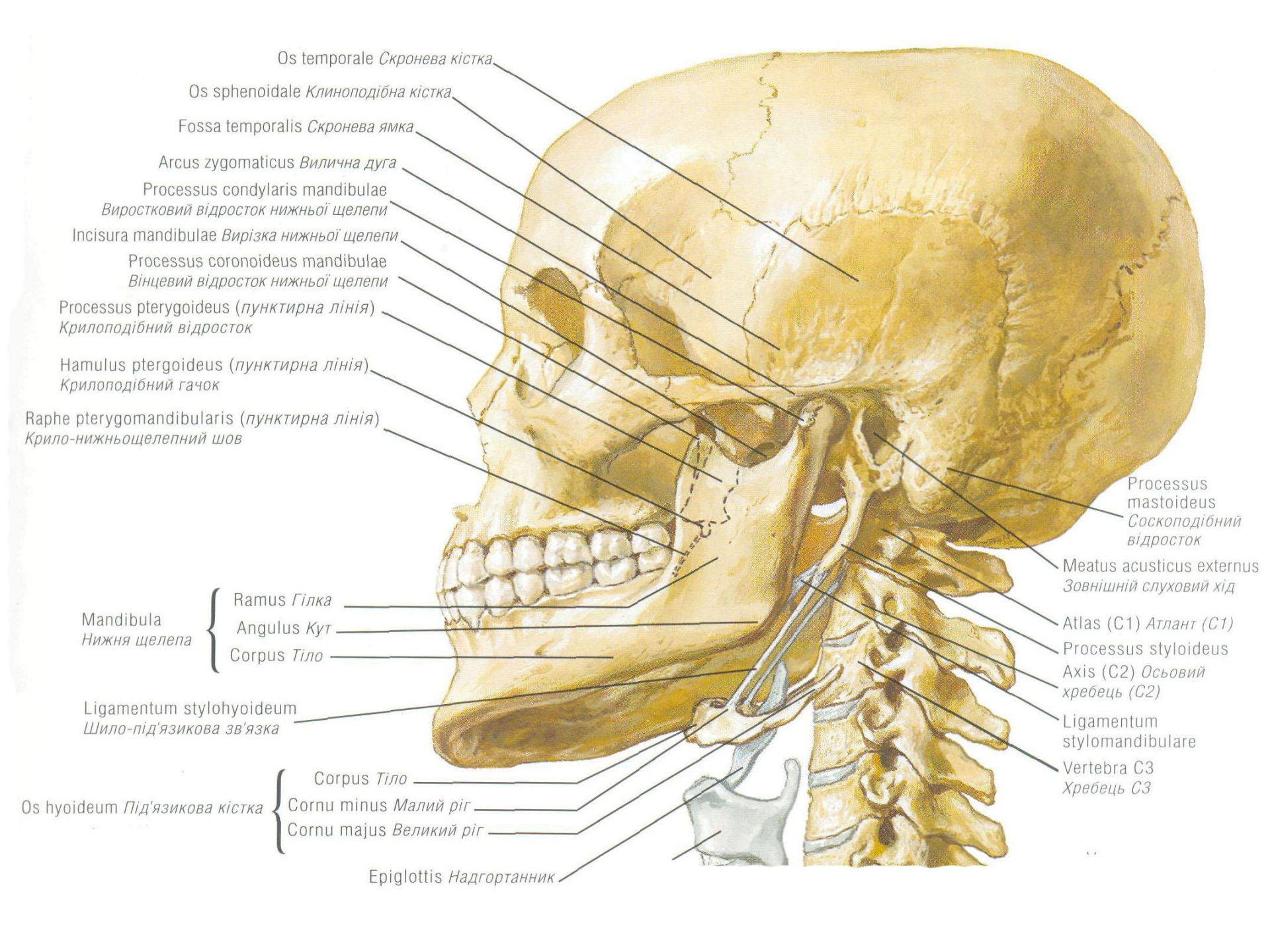
Sutures

Sutures are found only within the skull. They are characterized by a thin layer of connective tissue that binds the articulating bones.

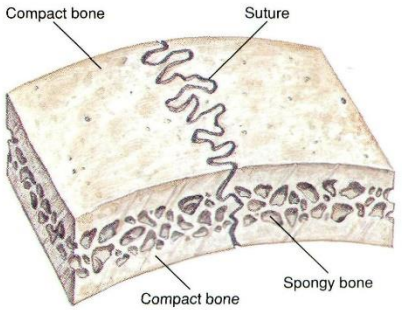
The types of sutures are:

- **Serrate (dentate) suture,**
- **Lap (squamous) suture,**
- **plane suture.**




Os temporale Скронева кістка
Os sphenoidale Клиноподібна кістка
Fossa temporalis Скронева ямка
Arcus zygomaticus Вилична дуга
Processus condylaris mandibulae
Виростковий відросток нижньої щелепи
Incisura mandibulae Вирізка нижньої щелепи
Processus coronoideus mandibulae
Вінцевий відросток нижньої щелепи
Processus pterygoideus (пунктирна лінія)
Крилоподібний відросток
Hamulus ptergoideus (пунктирна лінія)
Крилоподібний гачок
Raphe pterygomandibularis (пунктирна лінія)
Крило-нижньощелепний шов
Mandibula
Нижня щелепа
Ramus Гілка
Angulus Кут
Corpus Тіло
Ligamentum stylohyoideum
Шило-під'язикова зв'язка
Os hyoideum Під'язикова кістка
Corpus Тіло
Cornu minus Малий ріг
Cornu majus Великий ріг
Epiglottis Надгортанник
Processus mastoideus
Соскоподібний відросток
Meatus acusticus externus
Зовнішній слуховий хід
Atlas (C1) Атлант (C1)
Processus styloideus
Axis (C2) Осьовий хребець (C2)
Ligamentum stylomandibulare
Vertebra C3
Хребець C3

Склепіння черепа (calvaria)



Вигляд зверху

Os frontale
Лобова кістка

Sutura coronalis
Вінцевий шов

Bregma
Брегма

Os parietale
Тім'яна кістка

Sutura sagittalis
Сагітальний шов

Foramen parietale *Тім'яний отвір*
(для v. emissaria)

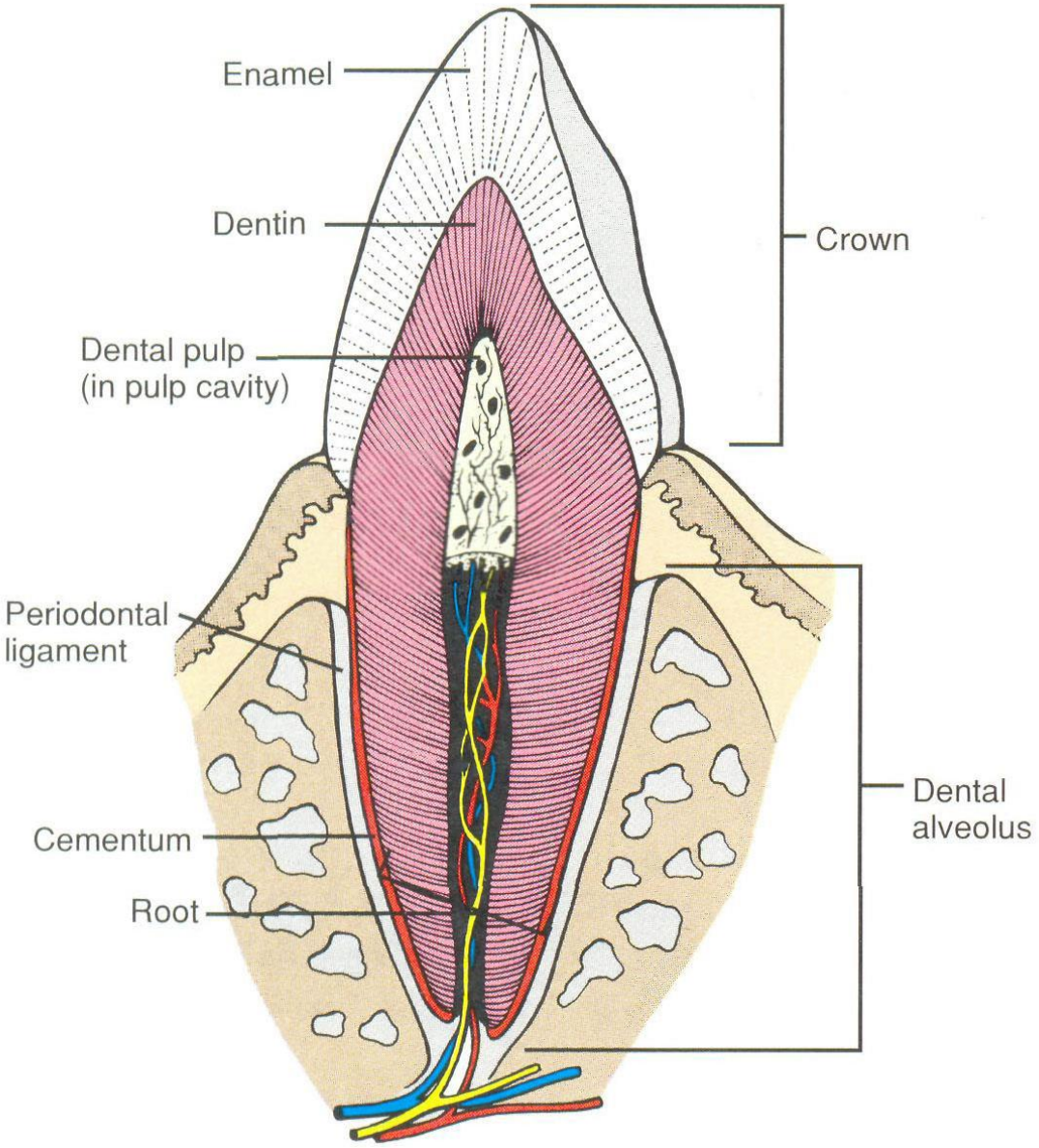
Lambda
Лямбда

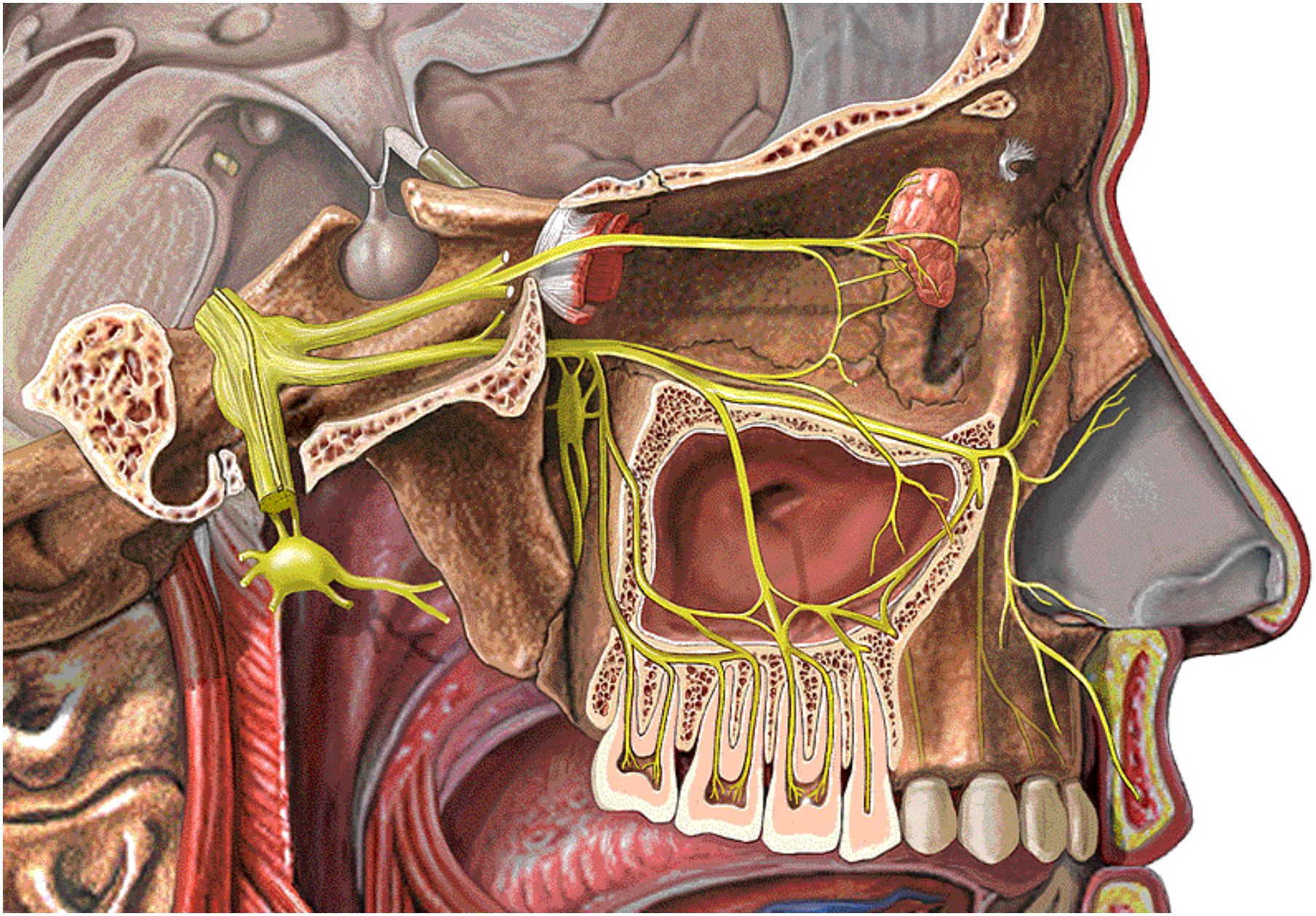
Sutura lambdoidea
Лямбдоподібний шов

Os occipitale
Потилична кістка

- **A syndesmosis type of fibrous joint unites the bones with a sheet of fibrous tissue, either a ligament or a fibrous membrane.**
- **The interosseous membrane in the forearm is a sheet of fibrous tissue that joins the radius and ulna in a syndesmosis.**

- **A gomphosis (socket), or dentoalveolar syndesmosis, is a fibrous joint in which a peg-like process fits into a socket articulation between the root of the tooth and the alveolar process of the jaw. Mobility of this joint (a loose tooth) indicates a pathological state affecting the supporting tissues of the tooth.**


Enamel
Dentin
Dental pulp
(in pulp cavity)
Periodontal
ligament
Cementum
Root
Crown
Dental
alveolus



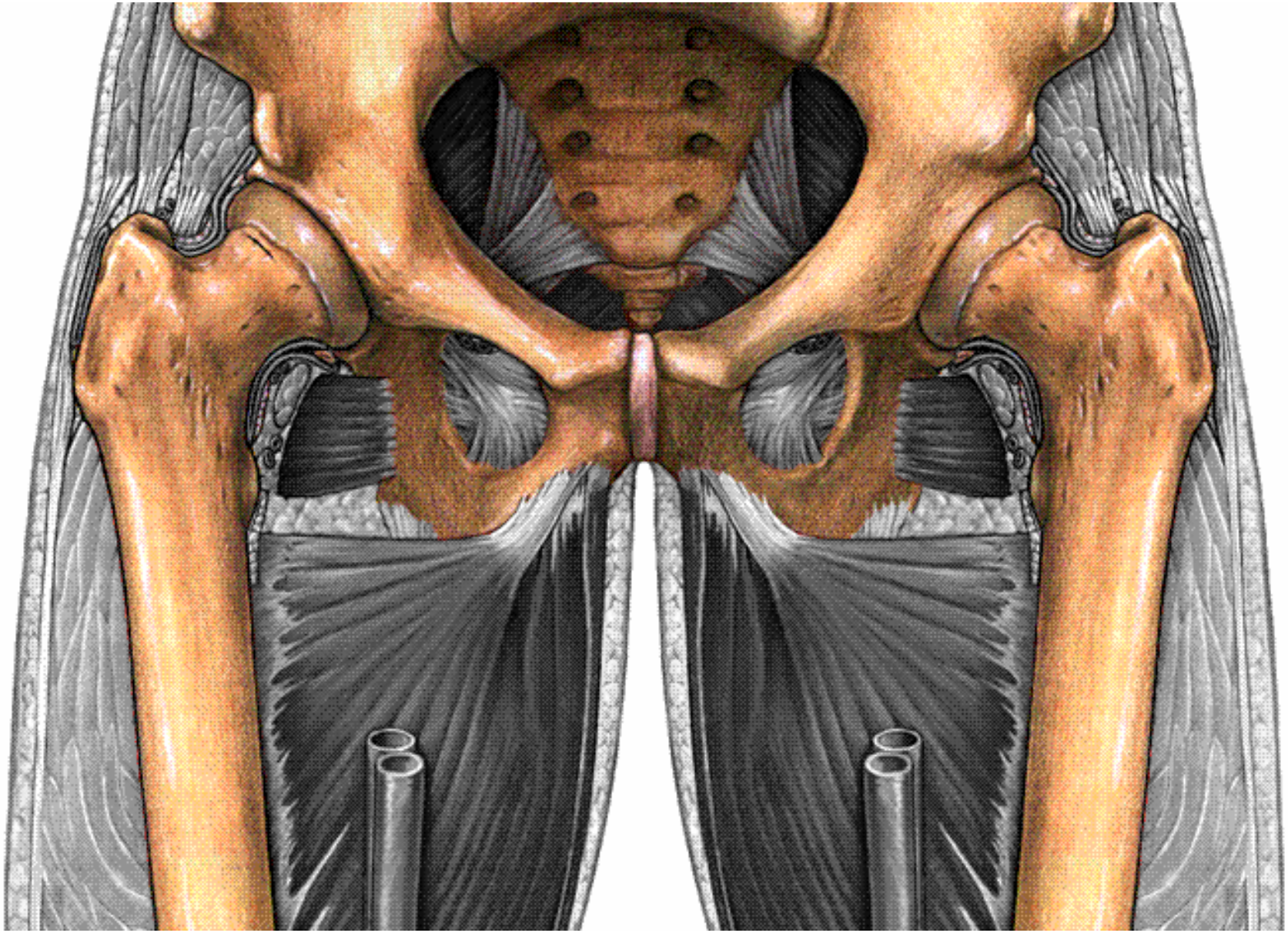
2.The types of synchondroses are:

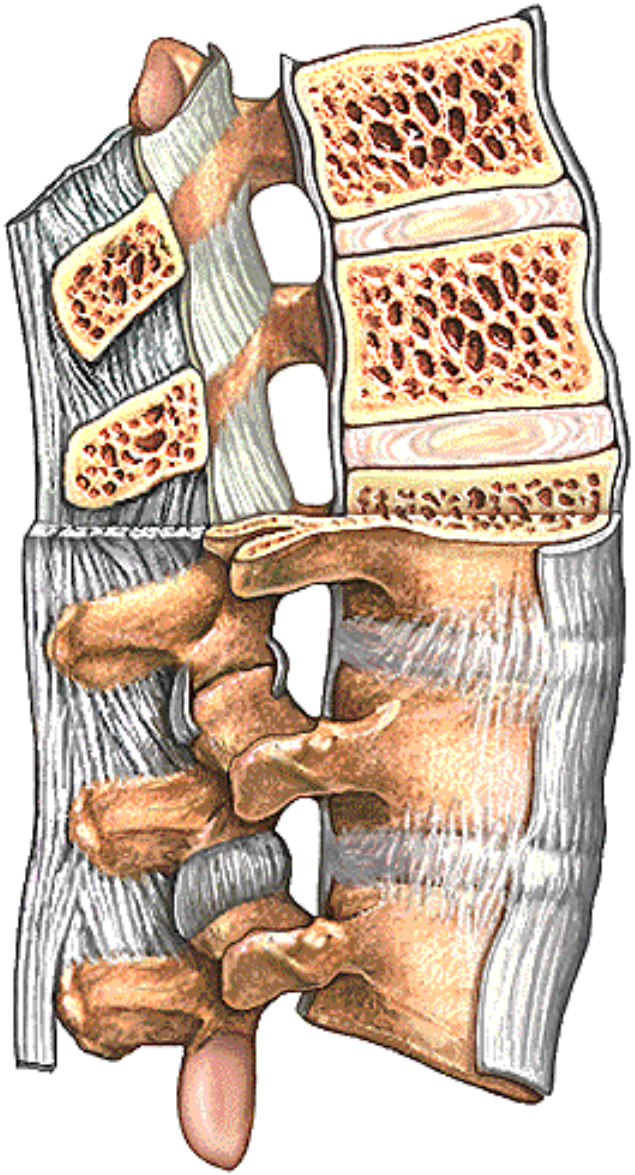
1.primary (temporary, permanent)

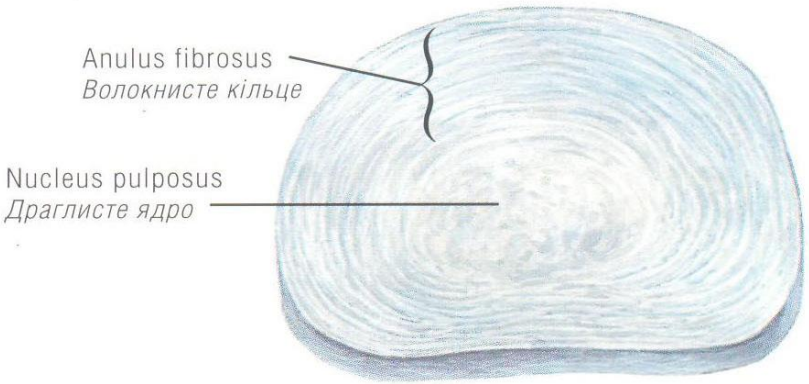
2.secondary

Symphyses are present where two bones are joined directly by a solid piece of fibrocartilage. For example pubic symphyses.

The second location of a secondary cartilaginous joint is between the bodies of vertebrae.



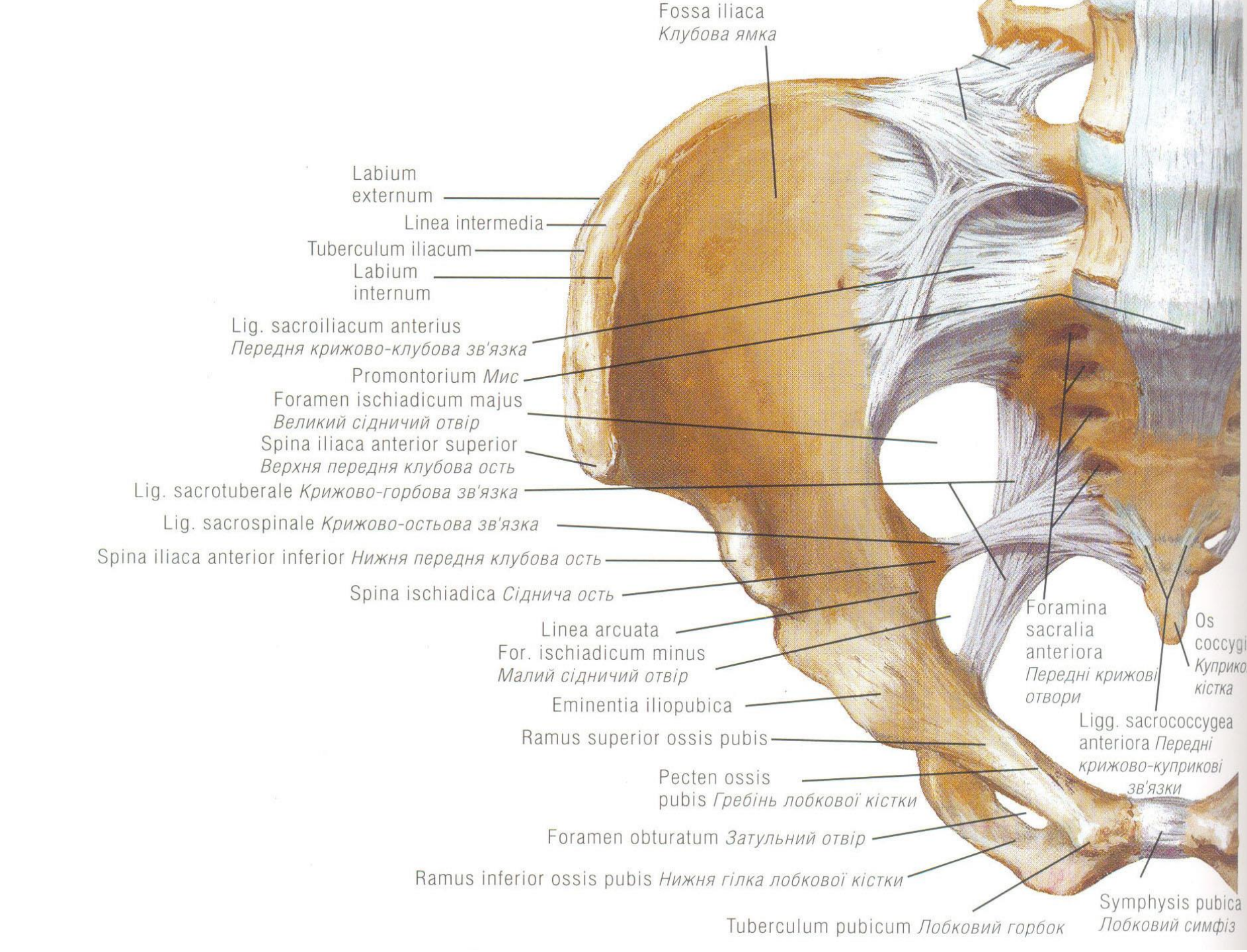


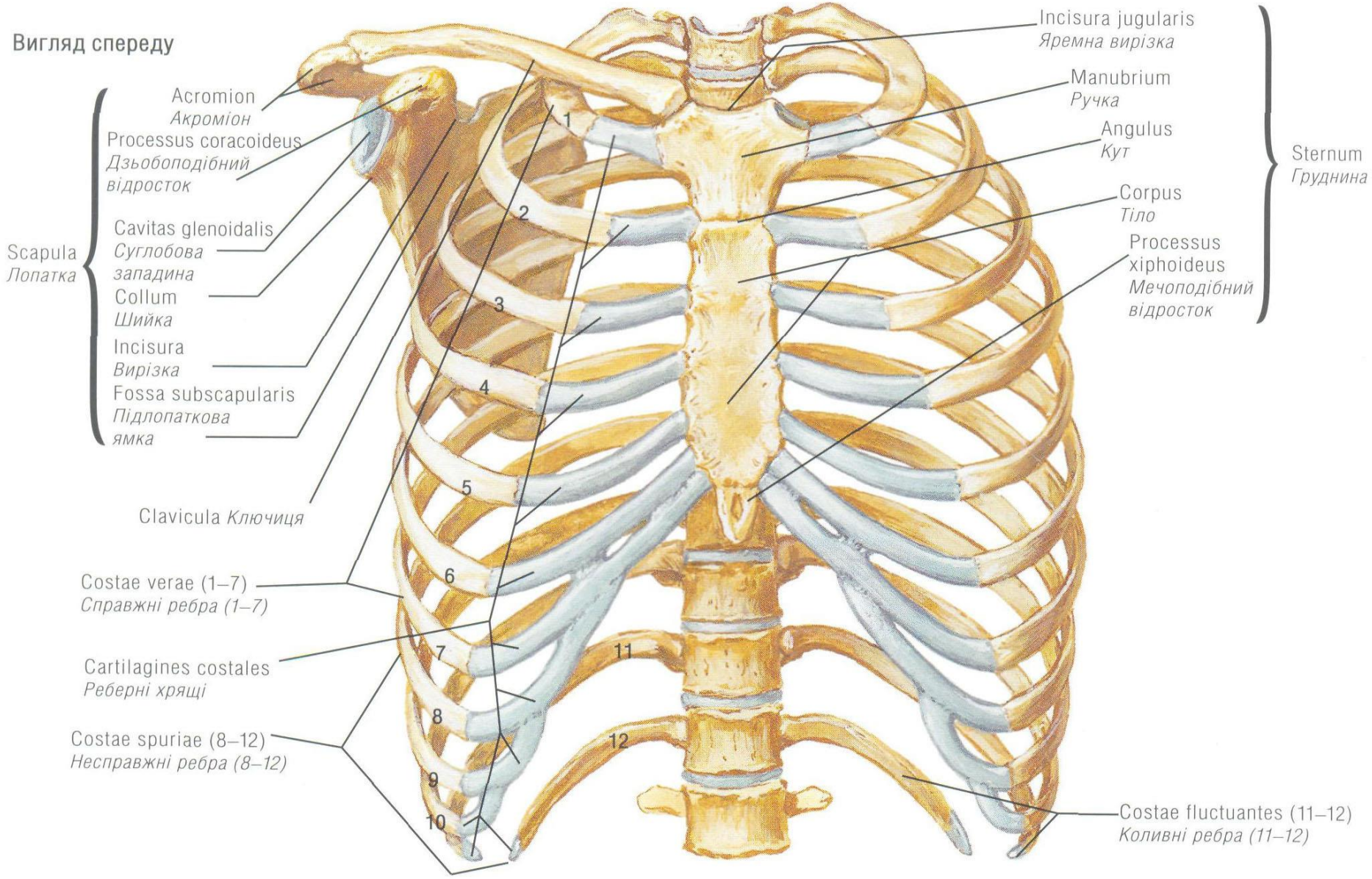


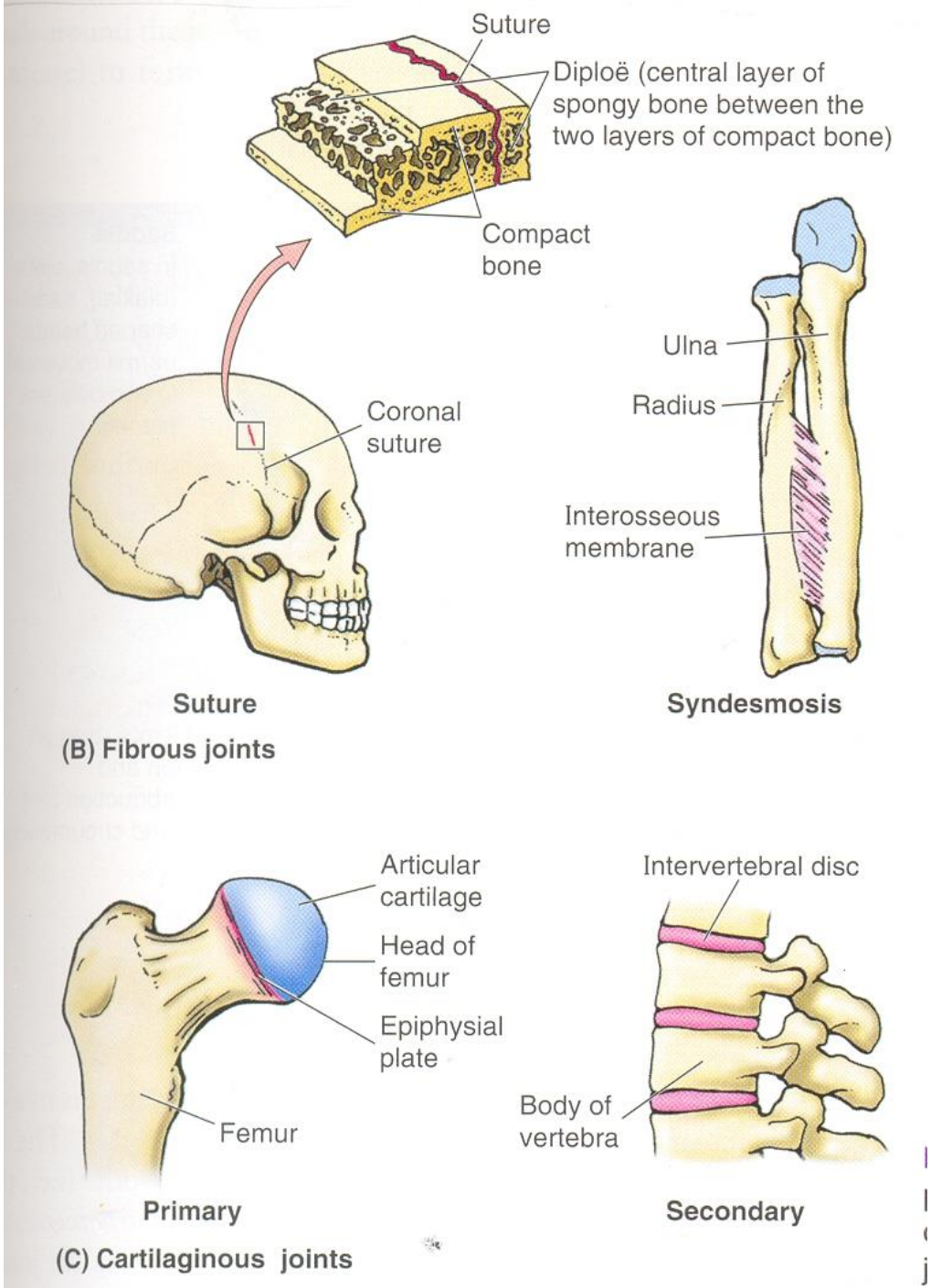
Міжхребцевий диск

When growth is complete, these synchondrotic joints ossify (synostosis,) and are no longer visible. For example – os sacrum.

The costal cartilages between the ends of the ribs and the costal cartilages that attach to the sternum are examples of synchondroses that do not ossify.(permanent)


Fossa iliaca
Клубова ямка
Labium externum
Linea intermedia
Tuberculum iliacum
Labium internum
Lig. sacroiliacum anterius
Передня крижово-клубова зв'язка
Promontorium Мис
Foramen ischiadicum majus
Великий сідничий отвір
Spina iliaca anterior superior
Верхня передня клубова ость
Lig. sacrotuberale Крижово-горбова зв'язка
Lig. sacrospinale Крижово-остьова зв'язка
Spina iliaca anterior inferior Нижня передня клубова ость
Spina ischiadica Сіднича ость
Linea arcuata
For. ischiadicum minus
Малий сідничий отвір
Eminentia iliopubica
Ramus superior ossis pubis
Pecten ossis pubis Гребінь лобкової кістки
Foramen obturatum Затульний отвір
Ramus inferior ossis pubis Нижня гілка лобкової кістки
Tuberculum pubicum Лобковий горбок
Foramina sacralia anteriora
Передні крижові отвори
Os coccygis
Куприкова кістка
Ligg. sacrococcygea anteriora Передні крижово-куприкові зв'язки
Symphysis pubica
Лобковий симфіз

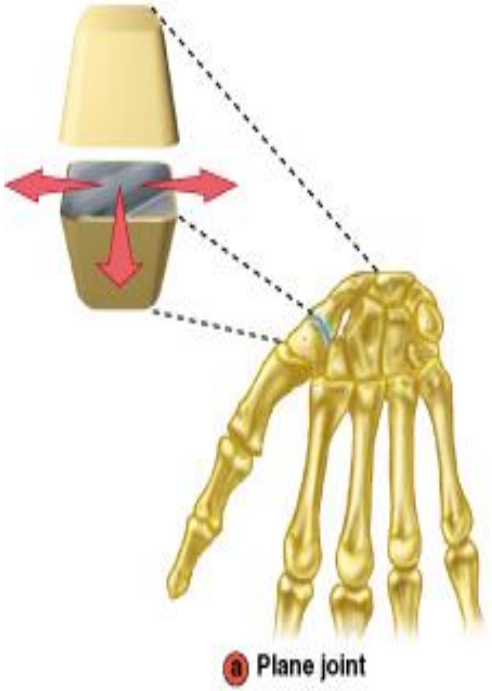

Вигляд спереду
Acromion
Акроміон
Processus coracoideus
Дзьобоподібний відросток
Scapula
Лопатка
Cavitas glenoidalis
Суглобова западина
Collum
Шийка
Incisura
Вирізка
Fossa subscapularis
Підлопаткова ямка
Clavicula Ключиця
Costae verae (1–7)
Справжні ребра (1–7)
Cartilagines costales
Реберні хрящі
Costae spuriae (8–12)
Несправжні ребра (8–12)
Incisura jugularis
Яремна вирізка
Manubrium
Ручка
Angulus
Кут
Corpus
Тіло
Processus xiphoideus
Мечоподібний відросток
Sternum
Груднина
Costae fluctuantes (11–12)
Коливні ребра (11–12)
1
2
3
4
5
6
7
8
9
10
11
12

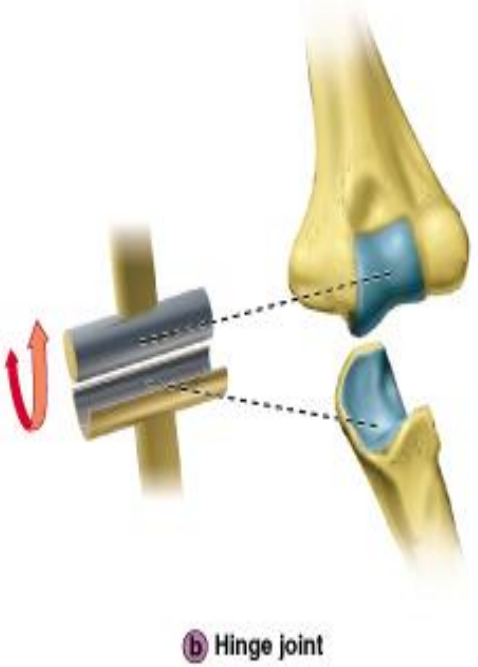

Suture
Diploë (central layer of spongy bone between the two layers of compact bone)
Compact bone
Coronal suture
Suture
Ulna
Radius
Interosseous membrane
Syndesmosis
(B) Fibrous joints
Articular cartilage
Head of femur
Epiphysial plate
Femur
Primary
Intervertebral disc
Body of vertebra
Secondary
(C) Cartilaginous joints

The most obvious type of articulation in the body is the freely movable synovial joint.

Types of Synovial Joints

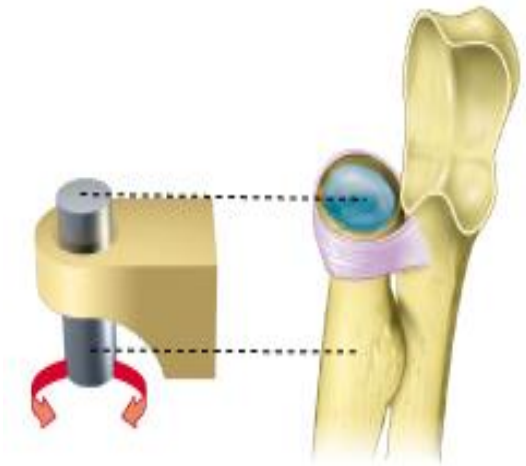
1. Plane joints
   - Articular surfaces are flat and allow short slipping or gliding movements.
   - Intercarpal and intertarsal joints
2. Hinge joints
   - A cylindrical projection of one bone fits into a trough-shaped surface on another (like a hotdog in a bun)
   - Movement resembles a door hinge.
   - Elbow joint – ulna and humerus; Interphalangeal joints

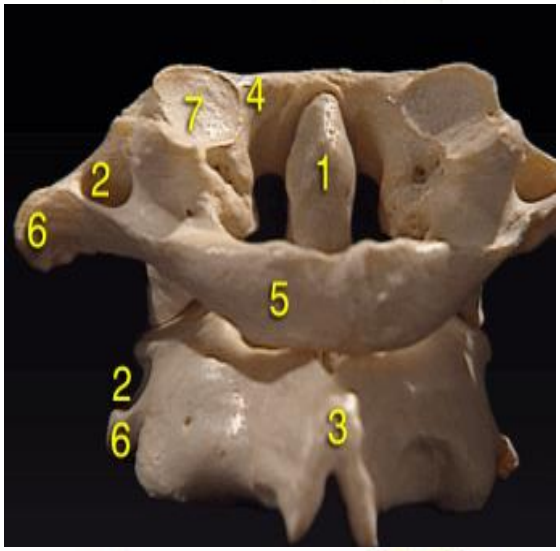


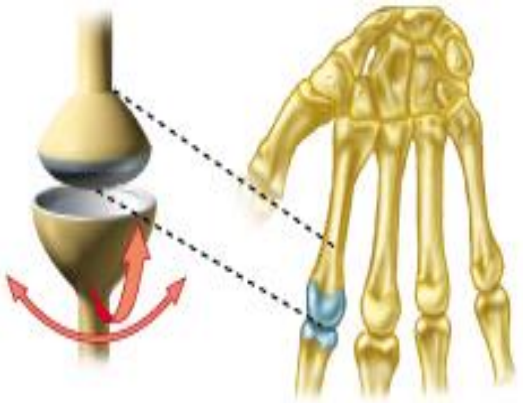


Type of Synovial Joints

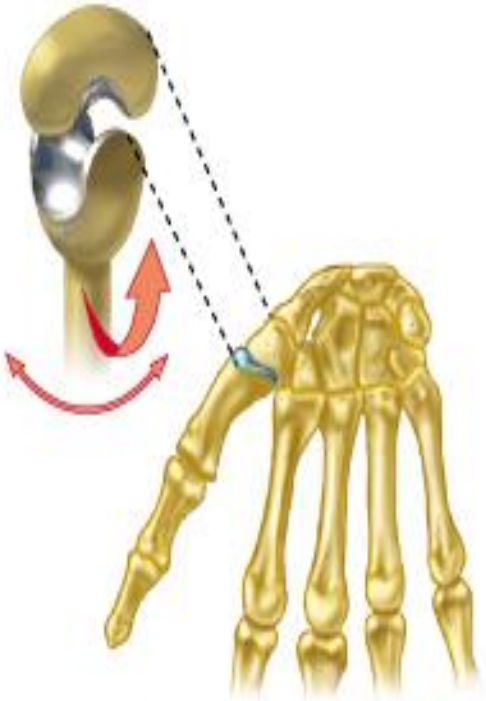
3. Pivot joints
   - Rounded end of one bone protrudes into a ring formed by another bone or by ligaments of that bone.
   - Proximal radioulnar joint
   - Atlas-axial joint
4. Condyloid joints
   - Oval articular surface of one bone fits into a complementary depression on another.
   - Radiocarpal joints
   - Metacarpophalangeal joints







Types of Synovial Joints

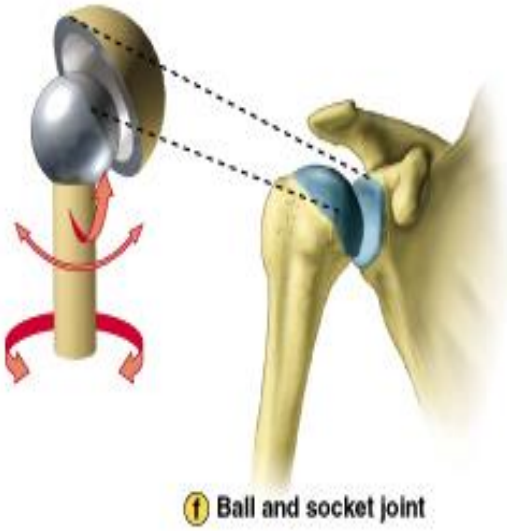


5. Saddle joints

- Each articular surface has convex and concave areas. Each articula surface is saddle-shaped.
- Carpometacarpal joints of the thumbs.

6. Ball-and-Socket joints

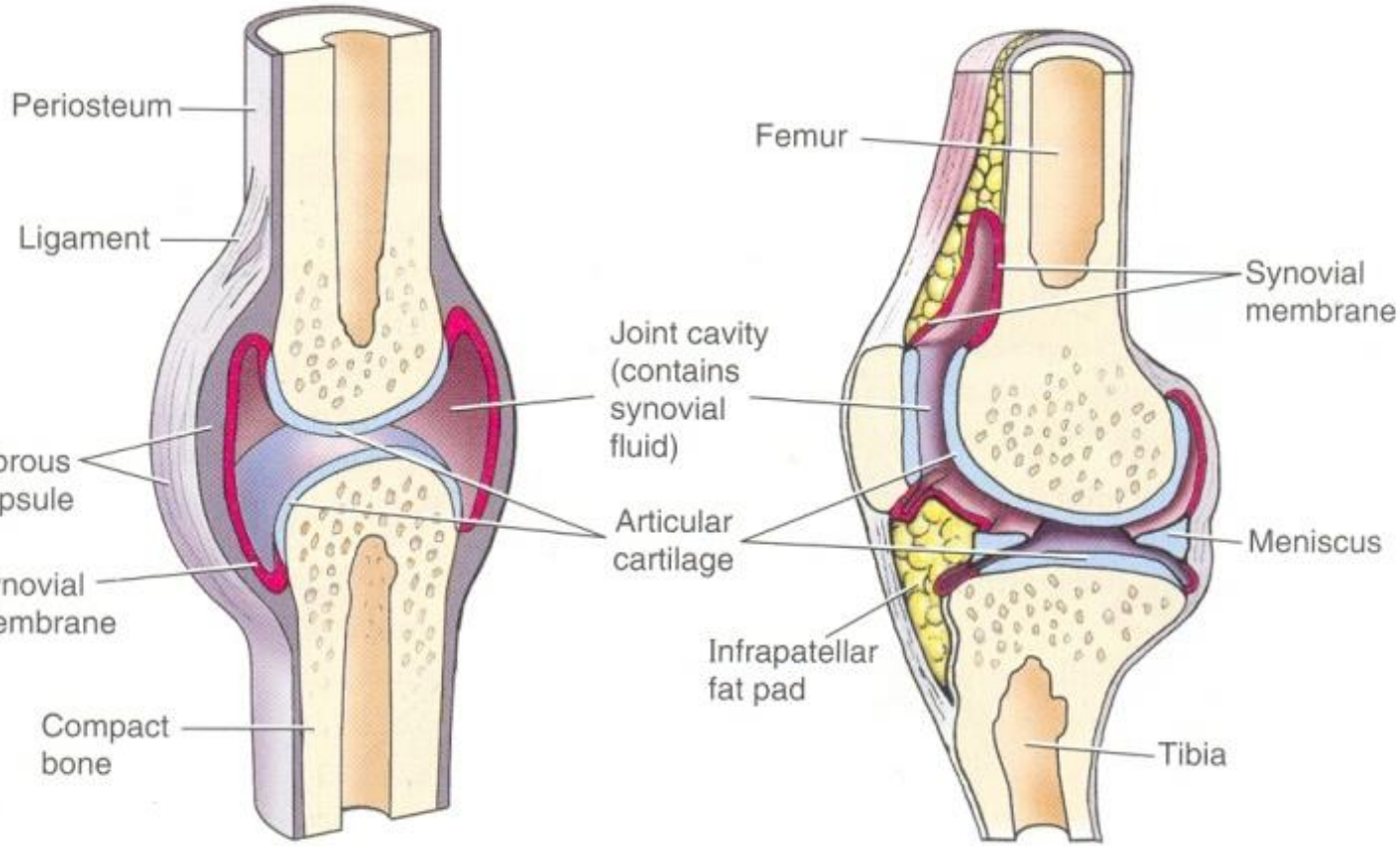
- Spherical or semi-spherical head of one bone articulates with the cuplike socket of another.
- Allow for much freedom of motion
- Shoulder and hip joints.



- **Synovial joints, the most common type of joint, provide free movement between the bones they join; they are joints of locomotion, typical of nearly all limb joints.**

Synovial joints are composed of:

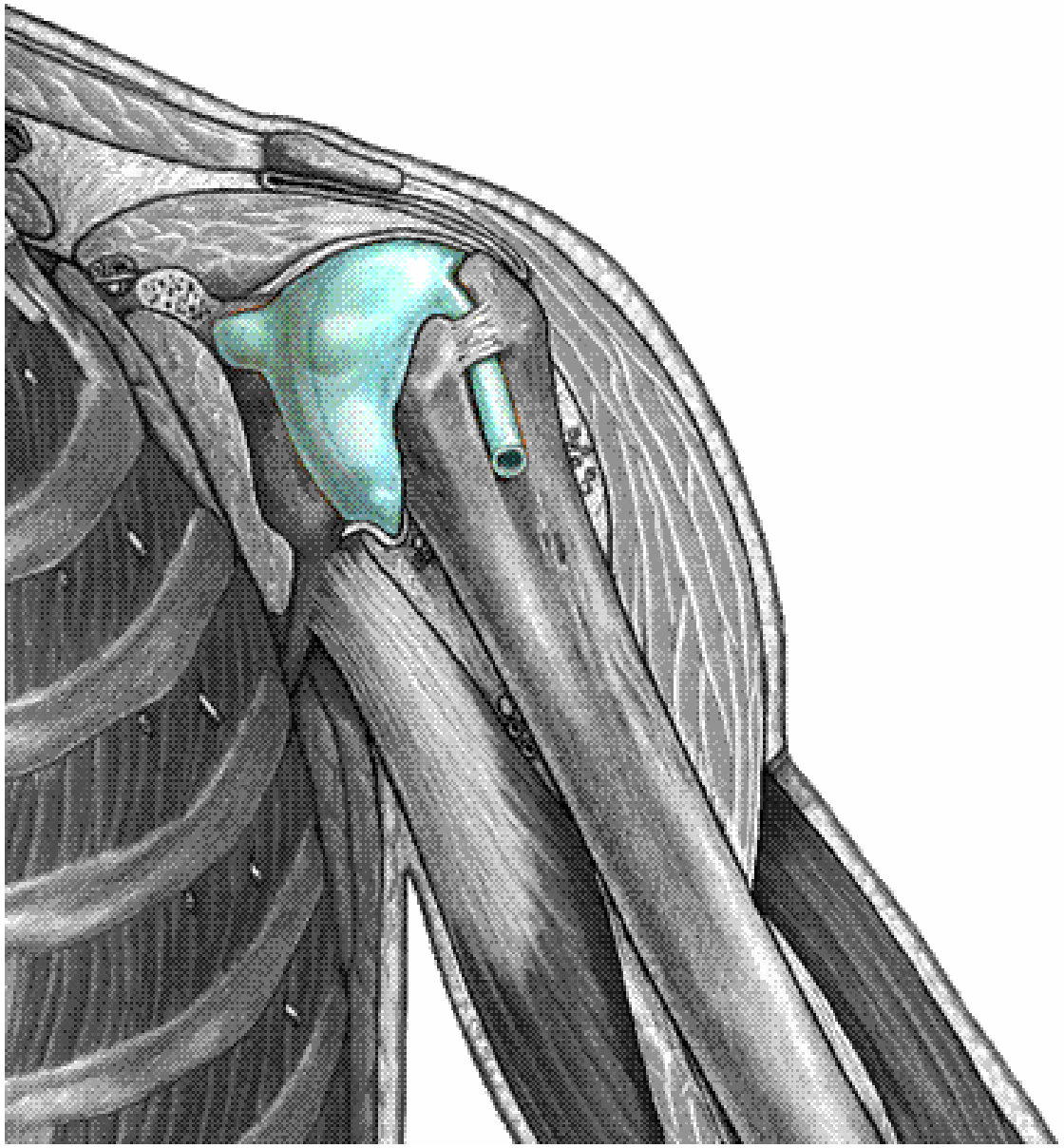
- fibroelastic joint capsule,
- joint cavity,
- joint surface.
- synovia.

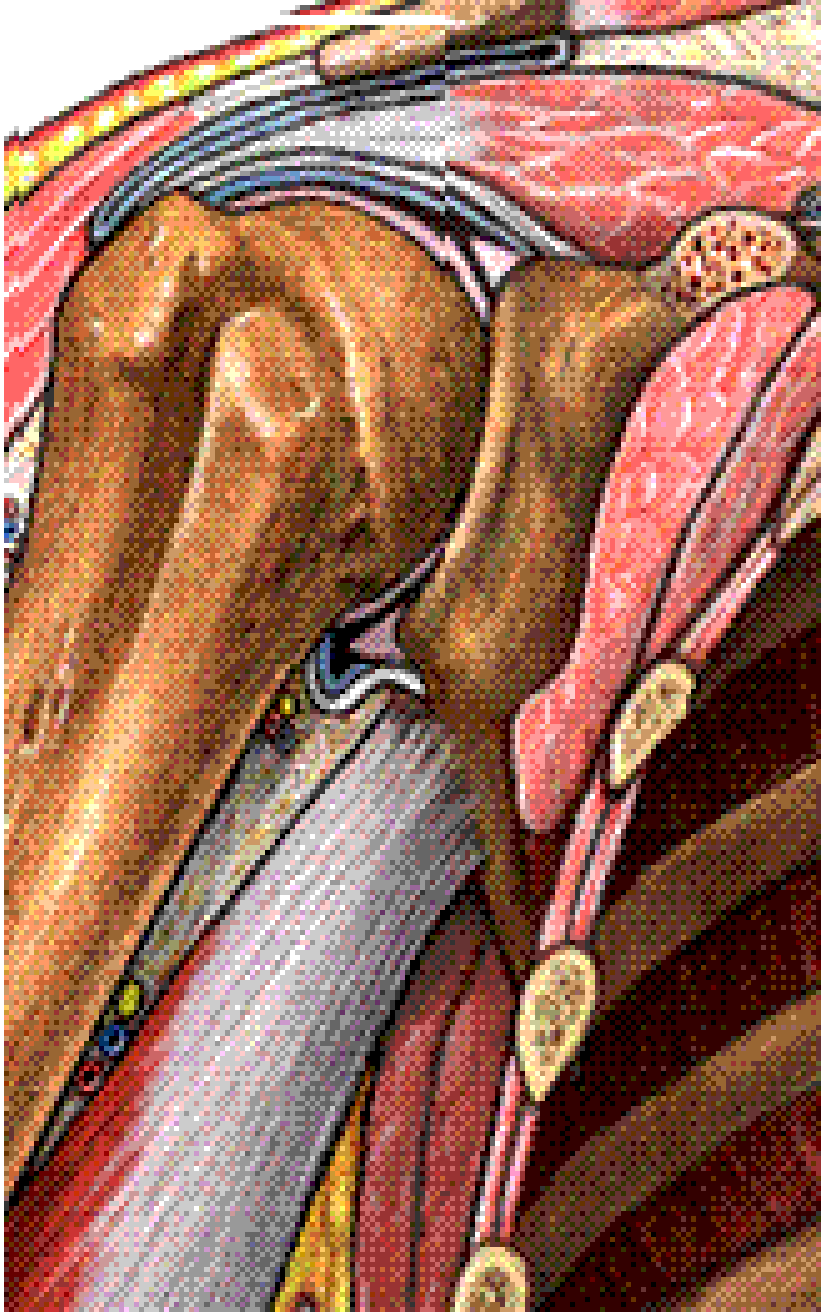


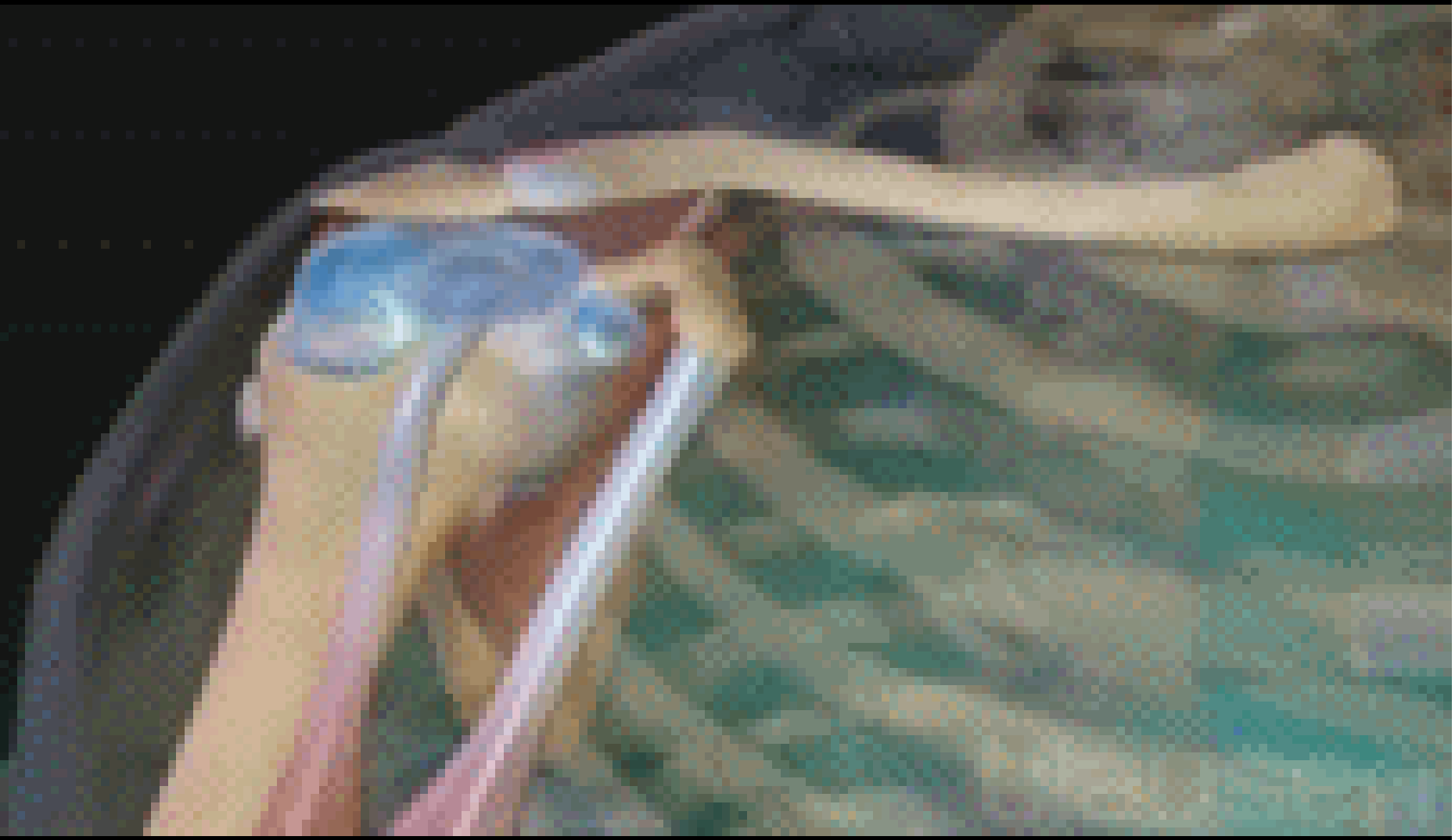
Schematic model

Knee joint

Synovial joints are enclosed by a fibroelastic joint capsule, which is filled with synovial fluid .

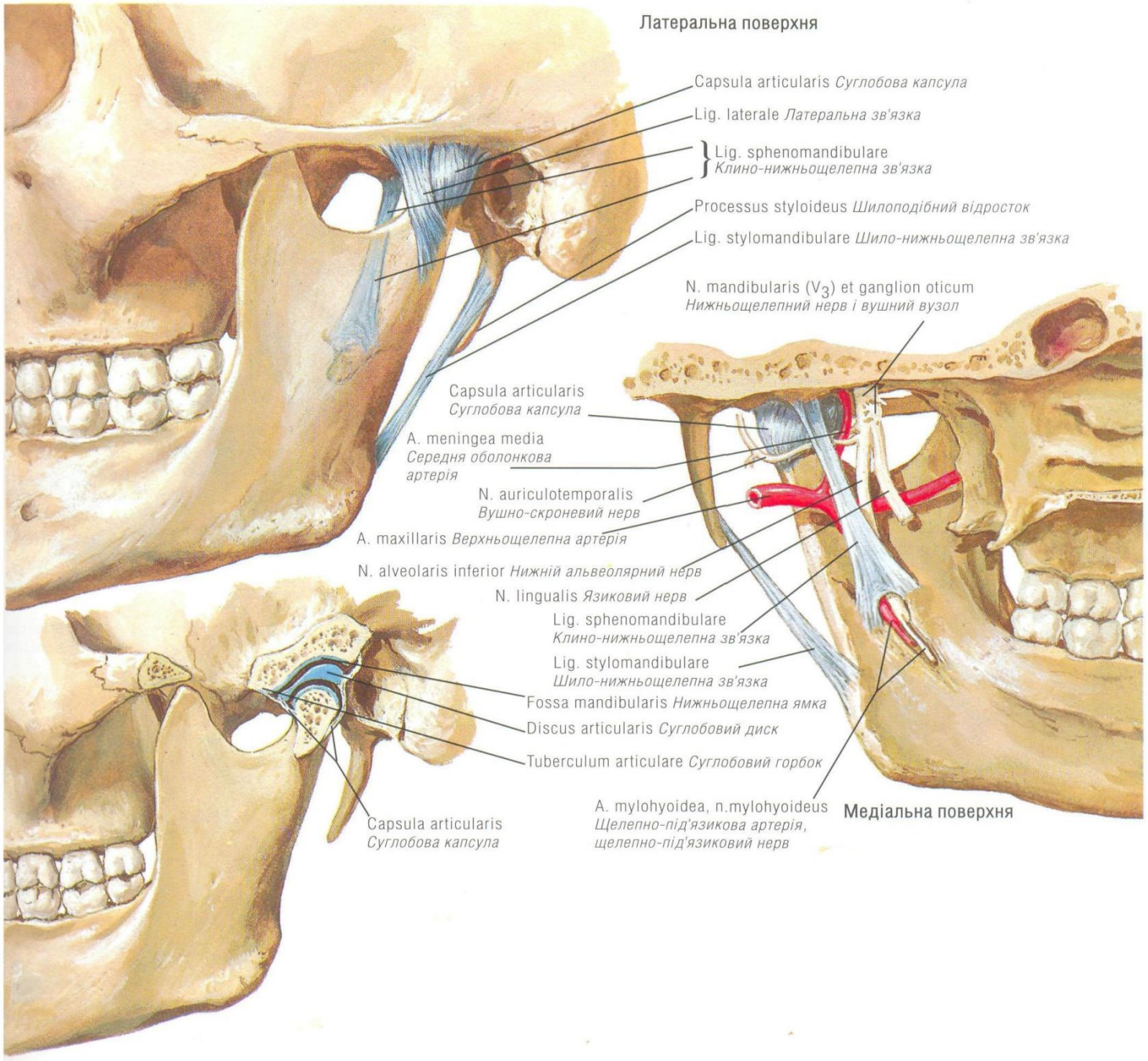




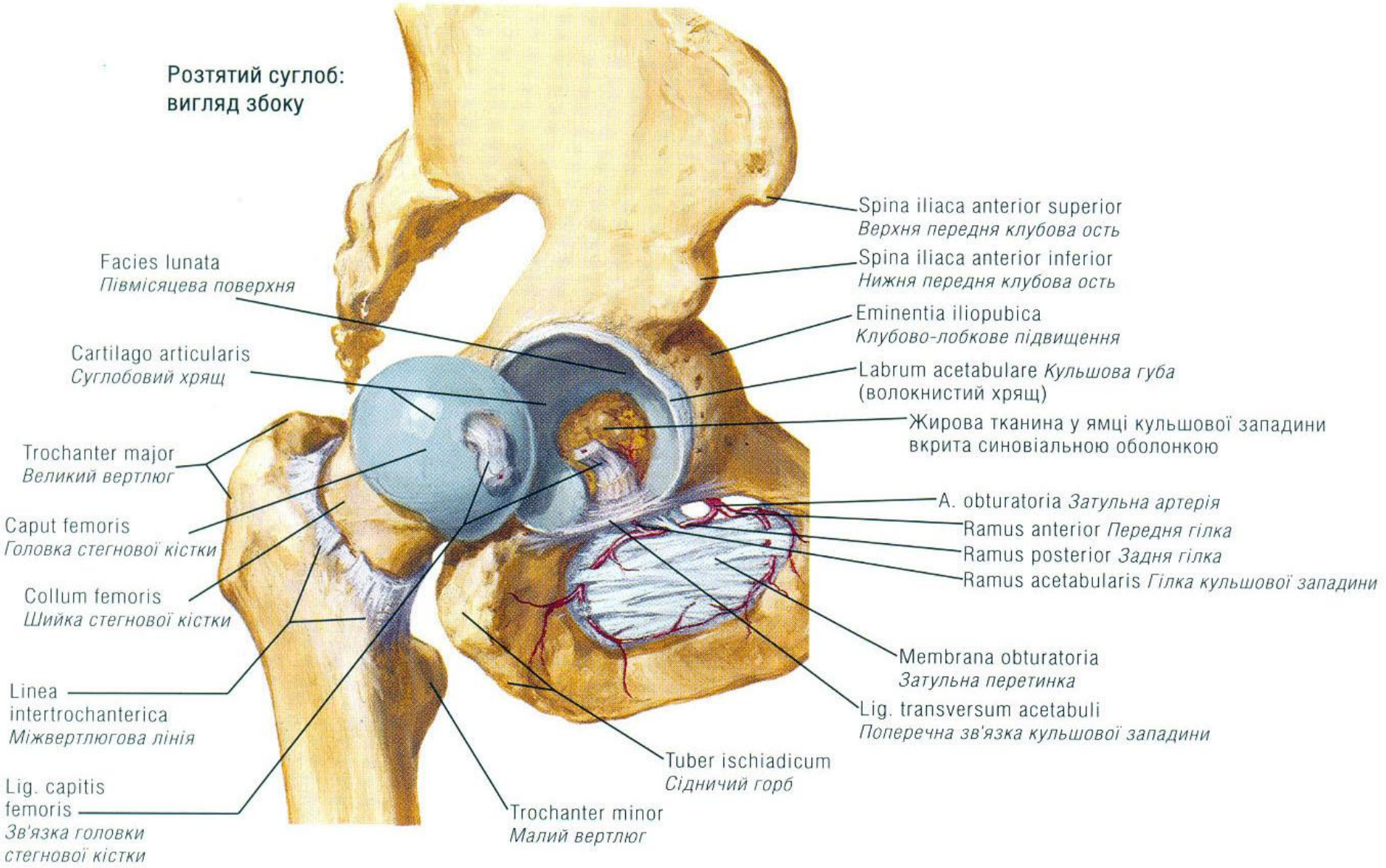


Ligaments help to bind the bones together in a synovial joint and may be located within the joint cavity or on the outside of the capsule.

Скронево-нижньощелепний суглоб (articulatio temporomandibularis)



Розтятий суглоб: вигляд збоку



Classification of joints

By the structure there are:

1) simple,
2) complicated (compound),
3) complex,
4) combinated.

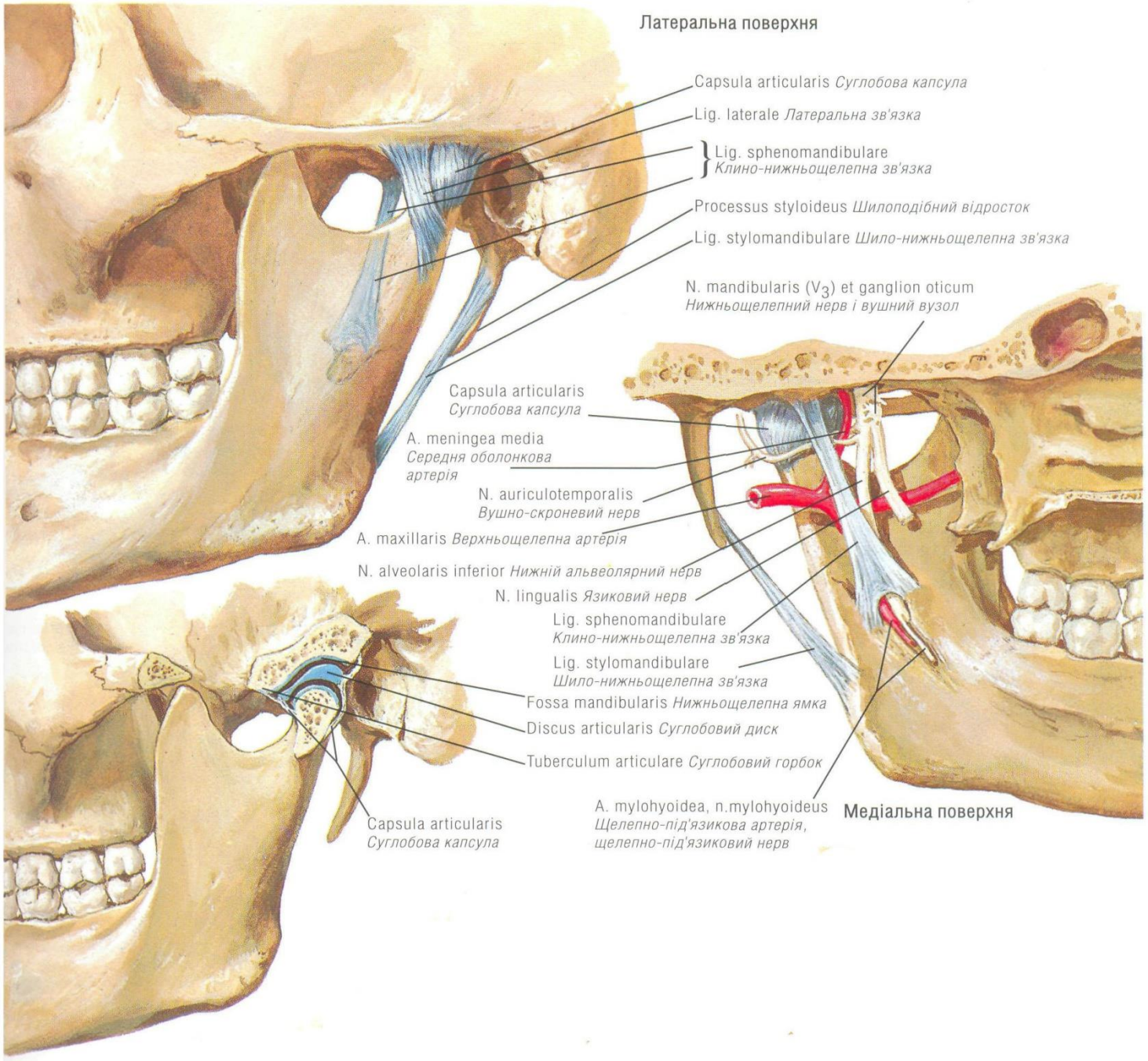
Simple joints is composed of two articular surfaces.

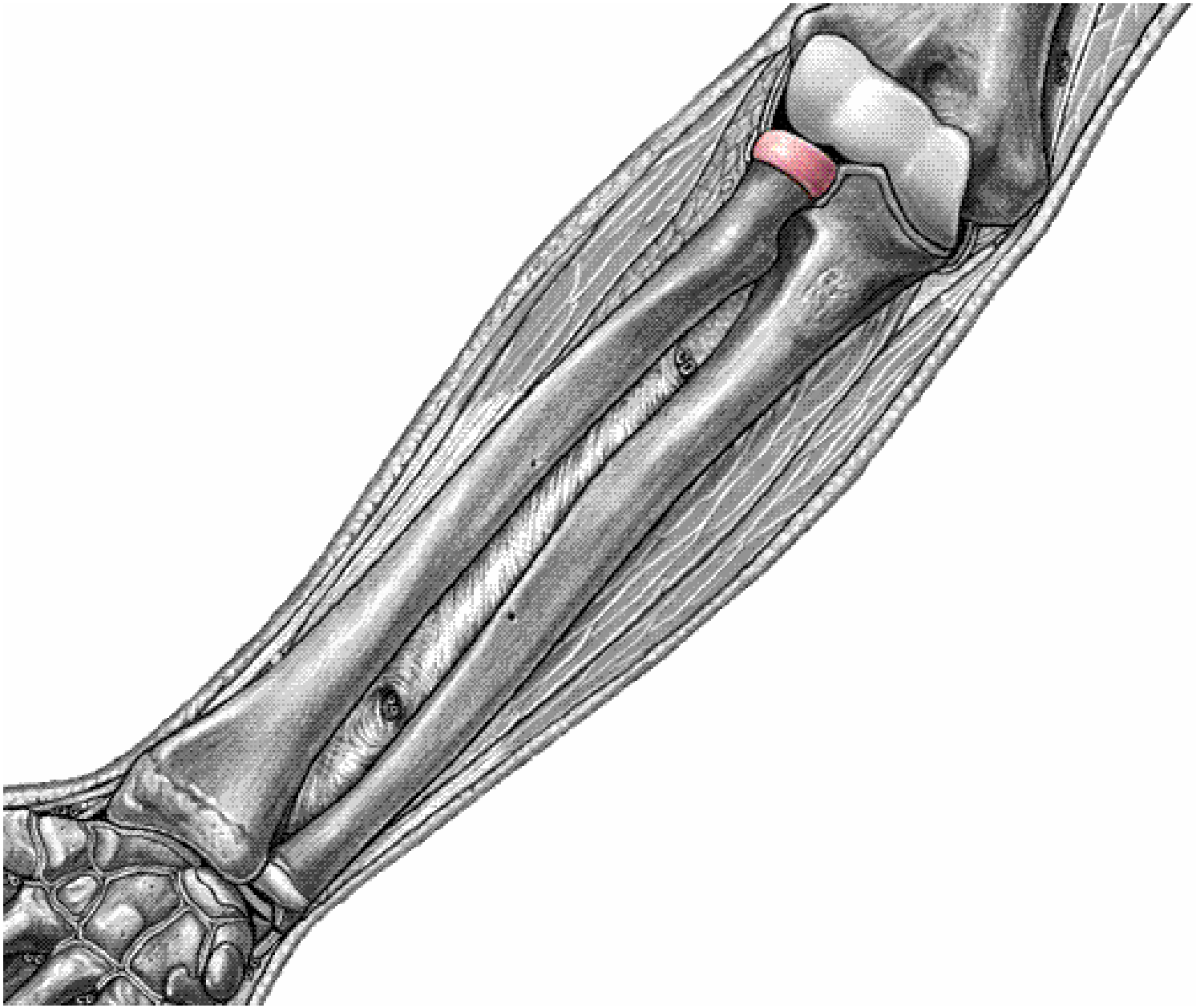
Complicated joints is composed of three or more surfaces .

Complex articulation - synovial joints, which have distinguishing features, such as fibrocartilaginous articular discs or menisci in cavity of articulation, which are present when the articulating surfaces of the bones are incongruous. Discs or menisci devide cavity into two floores fully (in the case of disc) or partly (in the case of menisc).

Combinated - some separated joints that move only together at the same time.

Скронево-нижньощелепний суглоб (articulatio temporomandibularis)



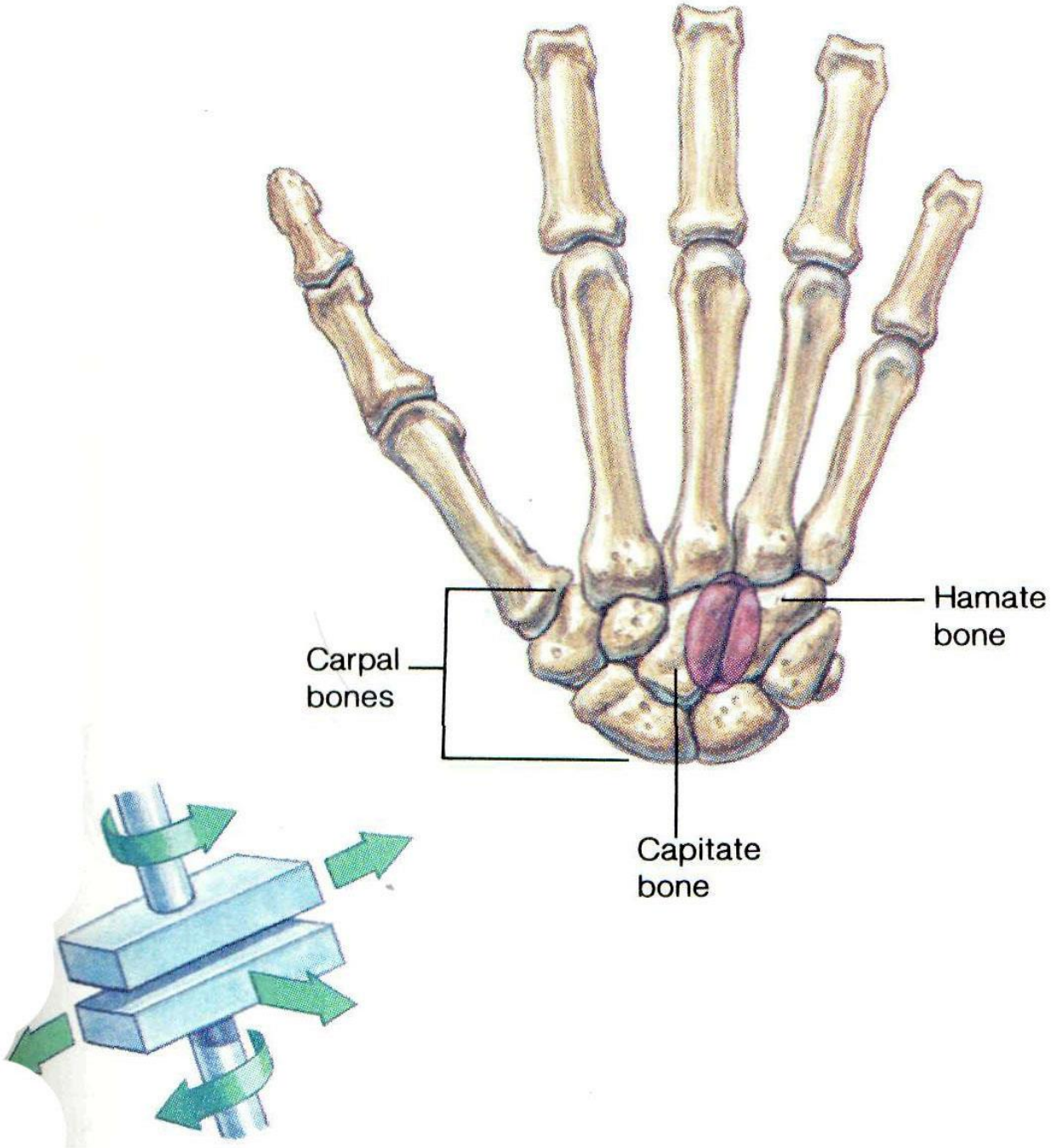


Kinds of synovial joints

- **Synovial joints are classified into six main types according to their structure and the motion they permit. The six types are gliding, hinge, pivot, condyloid, saddle, and ball and-socket.**

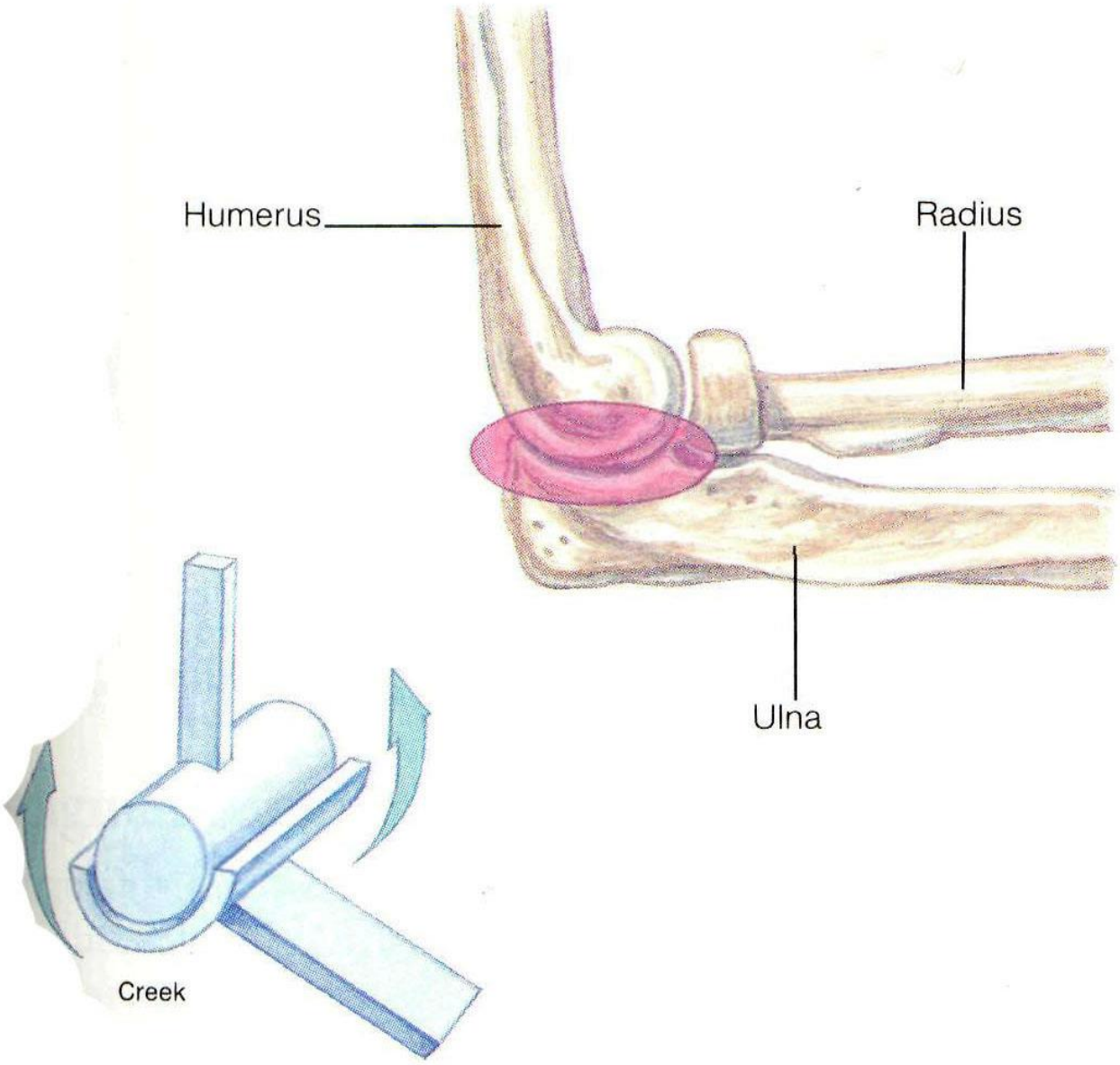
Gliding

This is the simplest type of synovial join movement. The articulating surfaces are nearly flat, or on may be slightly concave and the other slightly convex. The intercarpal and intertarsal joints are examples of gliding joints.


Hamate bone
Carpal bones
Capitate bone

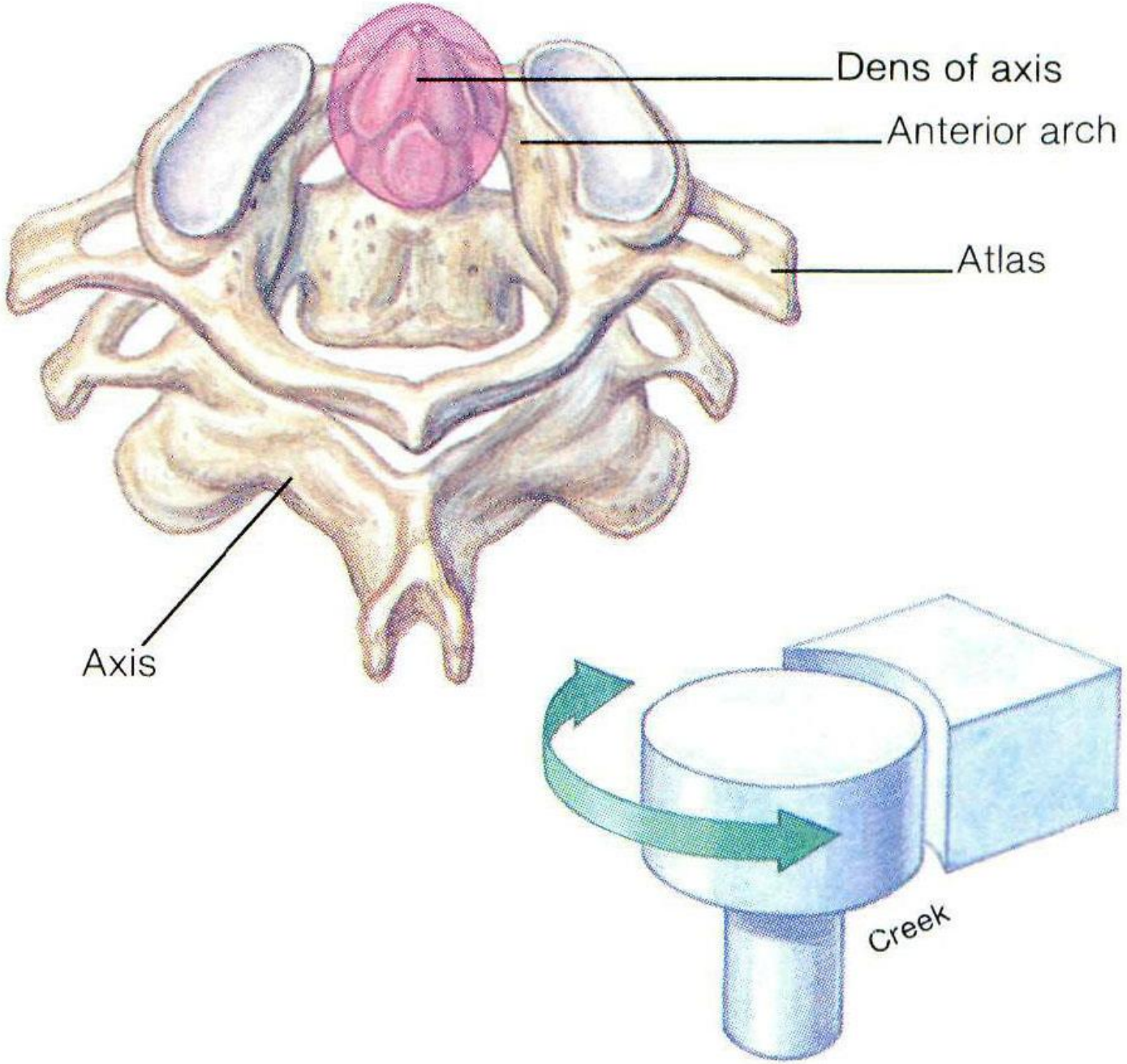
Hinge

The structure of a hinge joint permits bending in only one plane, much like the hinge of a door. In this type of articulation, the surface of one bone is concave, and the other convex. The elbow joint is the example of hinge joint.


Humerus
Radius
Ulna
Creek

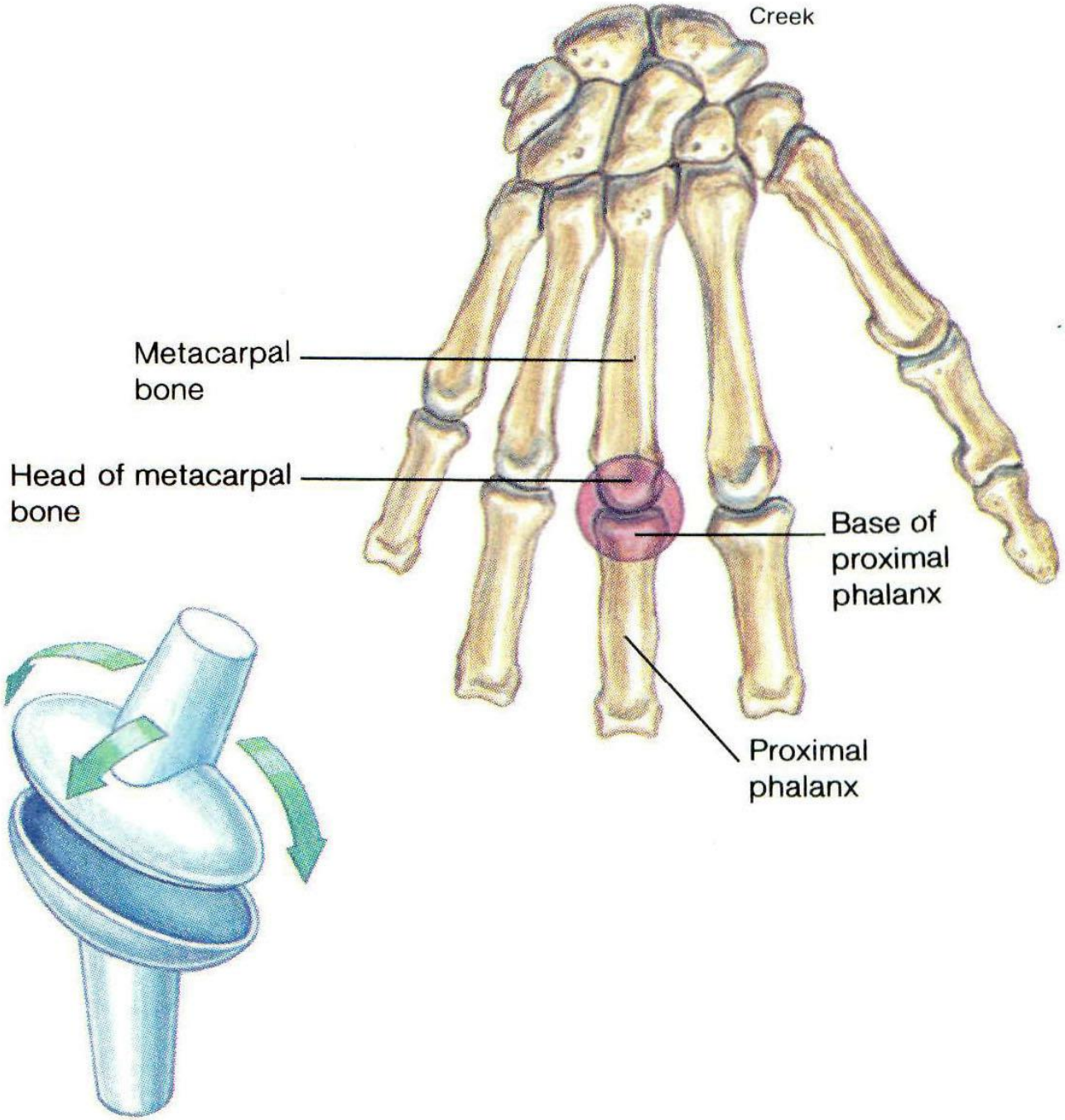
Pivot

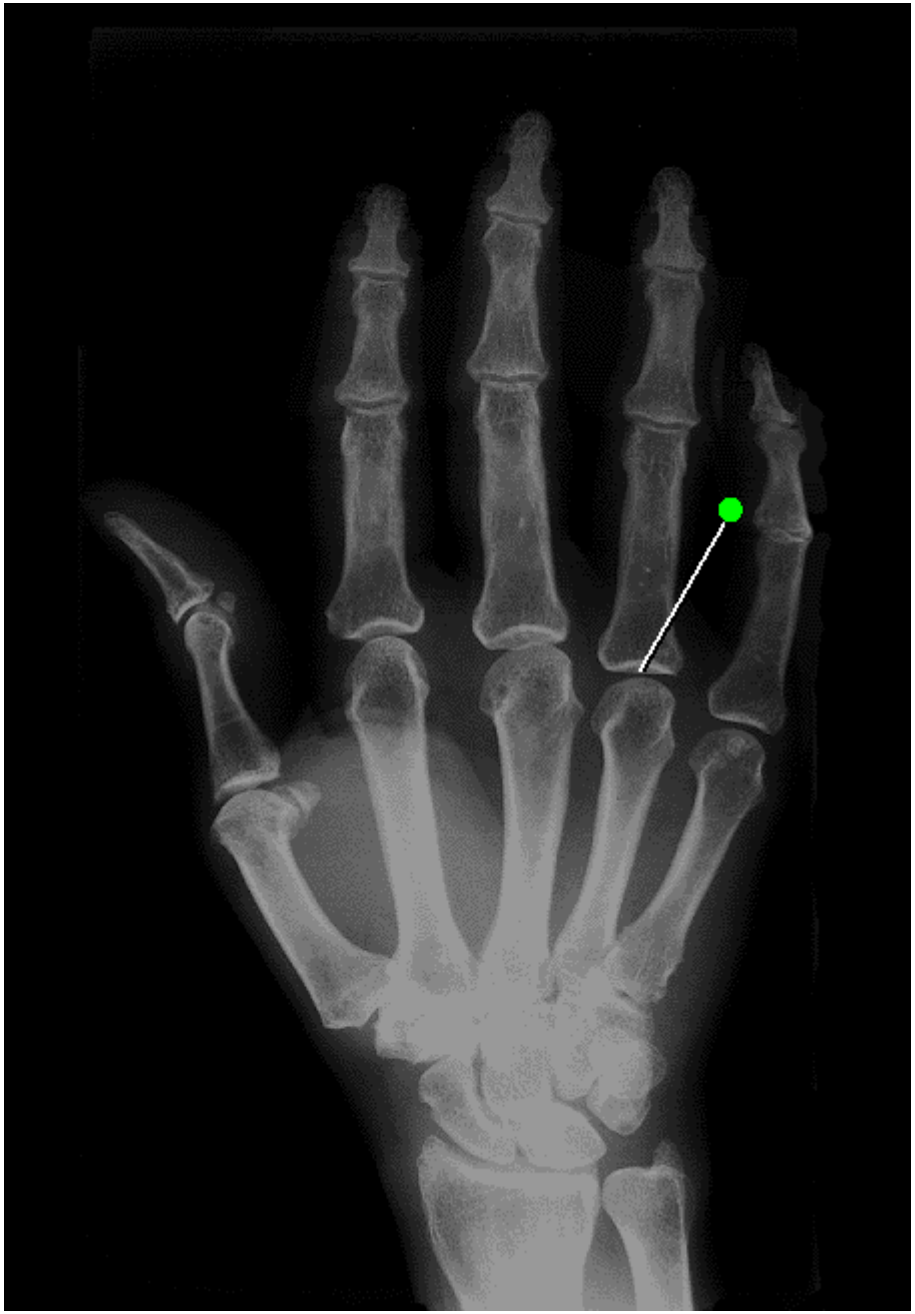
Pivot joints permit rotation around a central axis; thus they are uniaxial. In these joints, a rounded process of bone rotates within a sleeve or ring. An example is the *central atlantoaxial joint,* in which the atlas (Cl vertebra) rotates around a finger-like process, the dens (odontoid process) of the axis (C2 vertebra) during rotation of the head.


Dens of axis
Anterior arch
Atlas
Axis
Creek

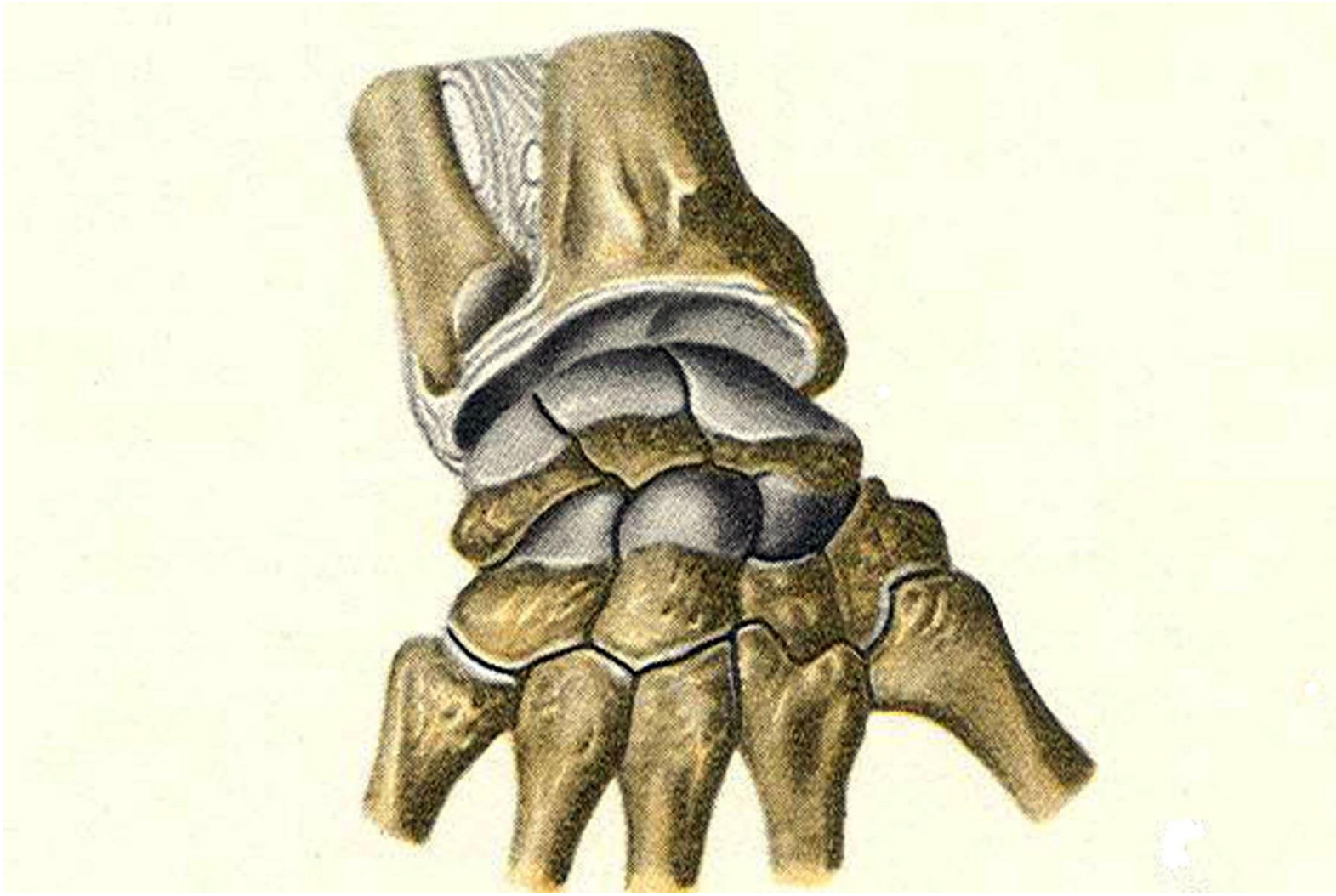
Condyloid

A condyloid articulation is structured so that an oval, convex surface of one bone fits into a concave depression on another bone. This permits movement in two directions (biaxial), as in up-and-down and side-to-side motions. The *metacarpophalangeal joints* are examples.


Creek
Metacarpal bone
Head of metacarpal bone
Base of proximal phalanx
Proximal phalanx



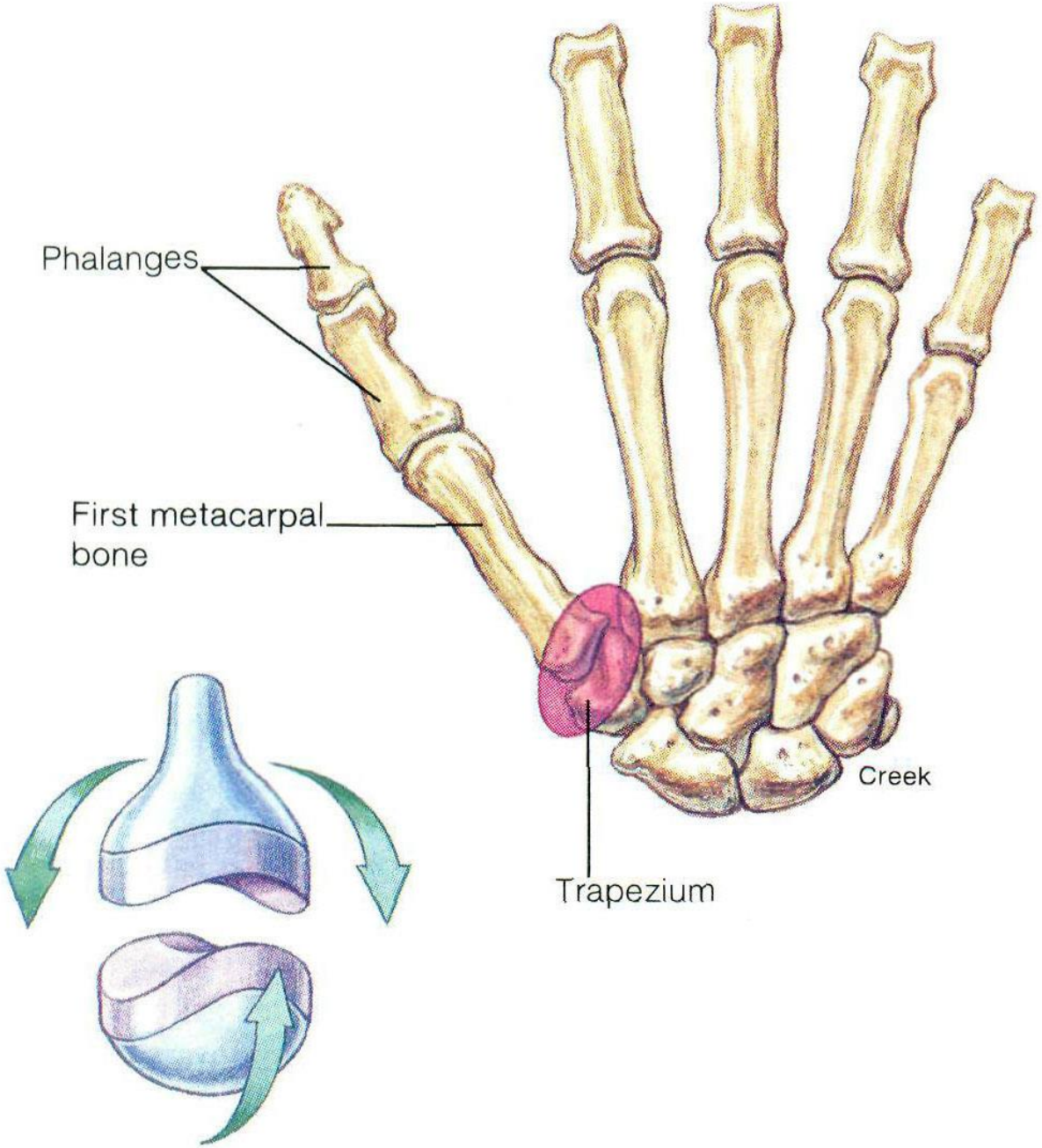
Articulatio ellipsoidea

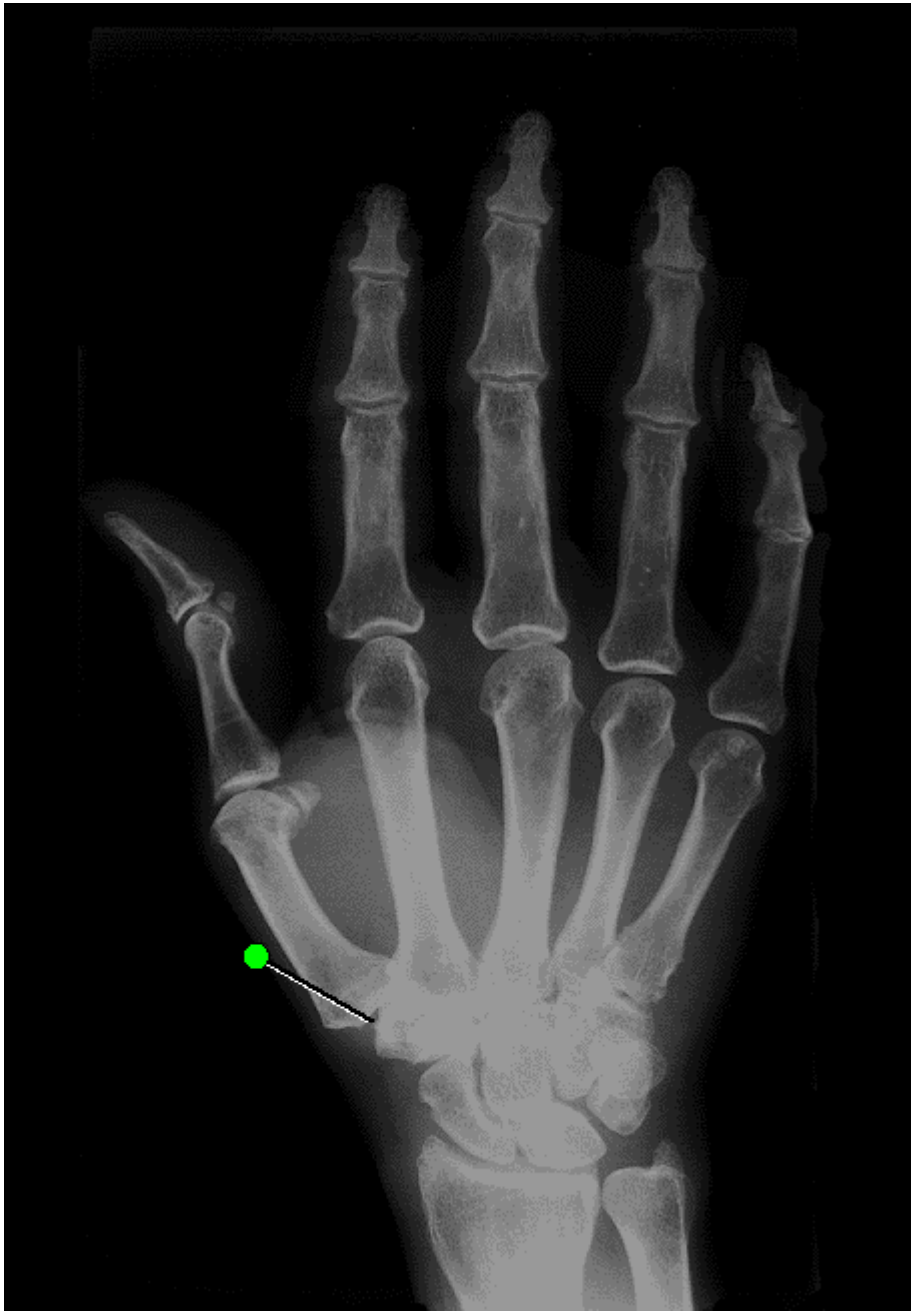


Articulatio radiocarpea

Saddle

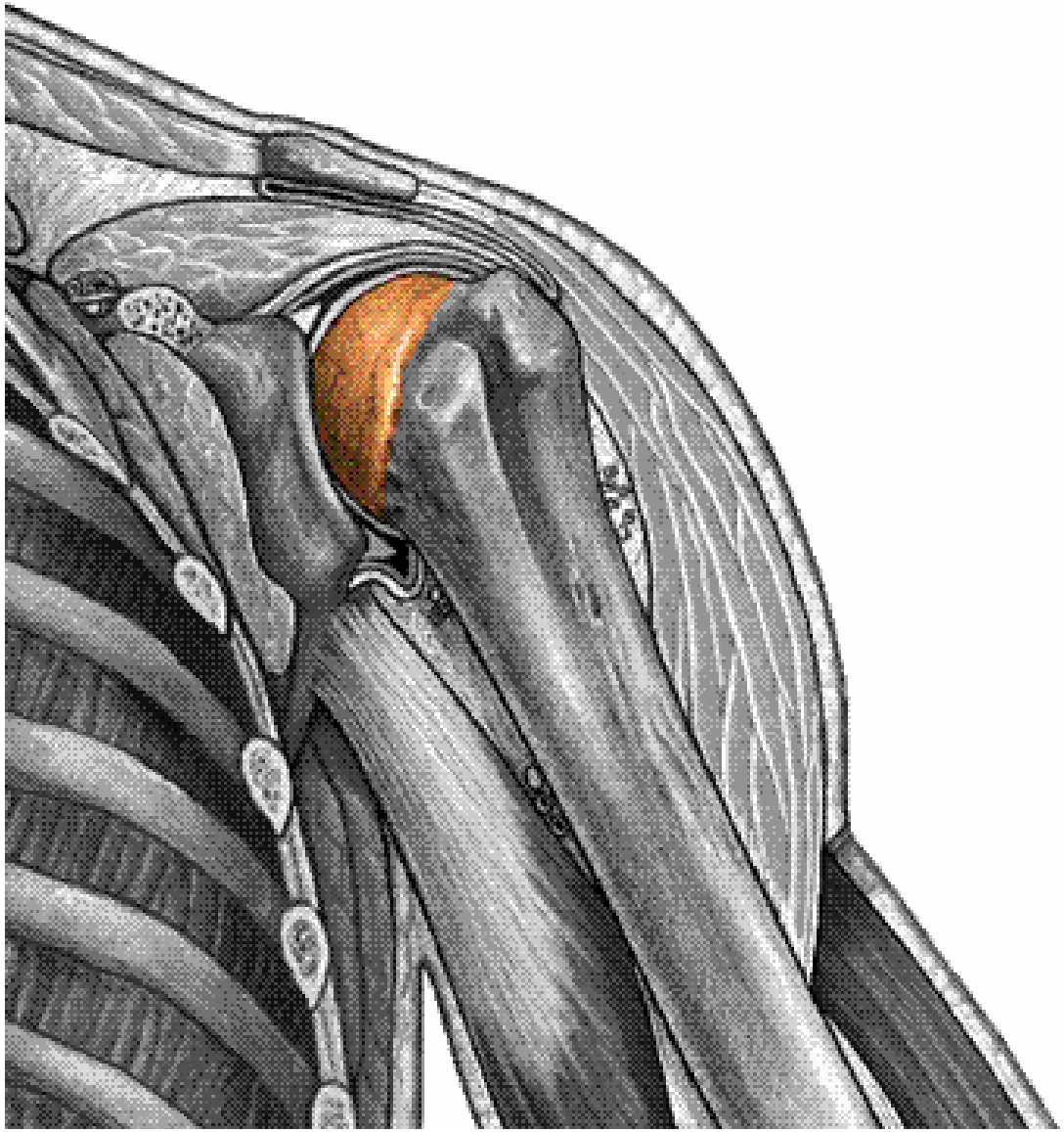
Each articular process of a saddle-shaped joint has a concave surface in one direction and a convex surface in another. This articulation is a modified condyloid joint that allows a wide range of movement. The carpometacarpal joints at the base of the 1st digit (thumb) is a saddle joint.

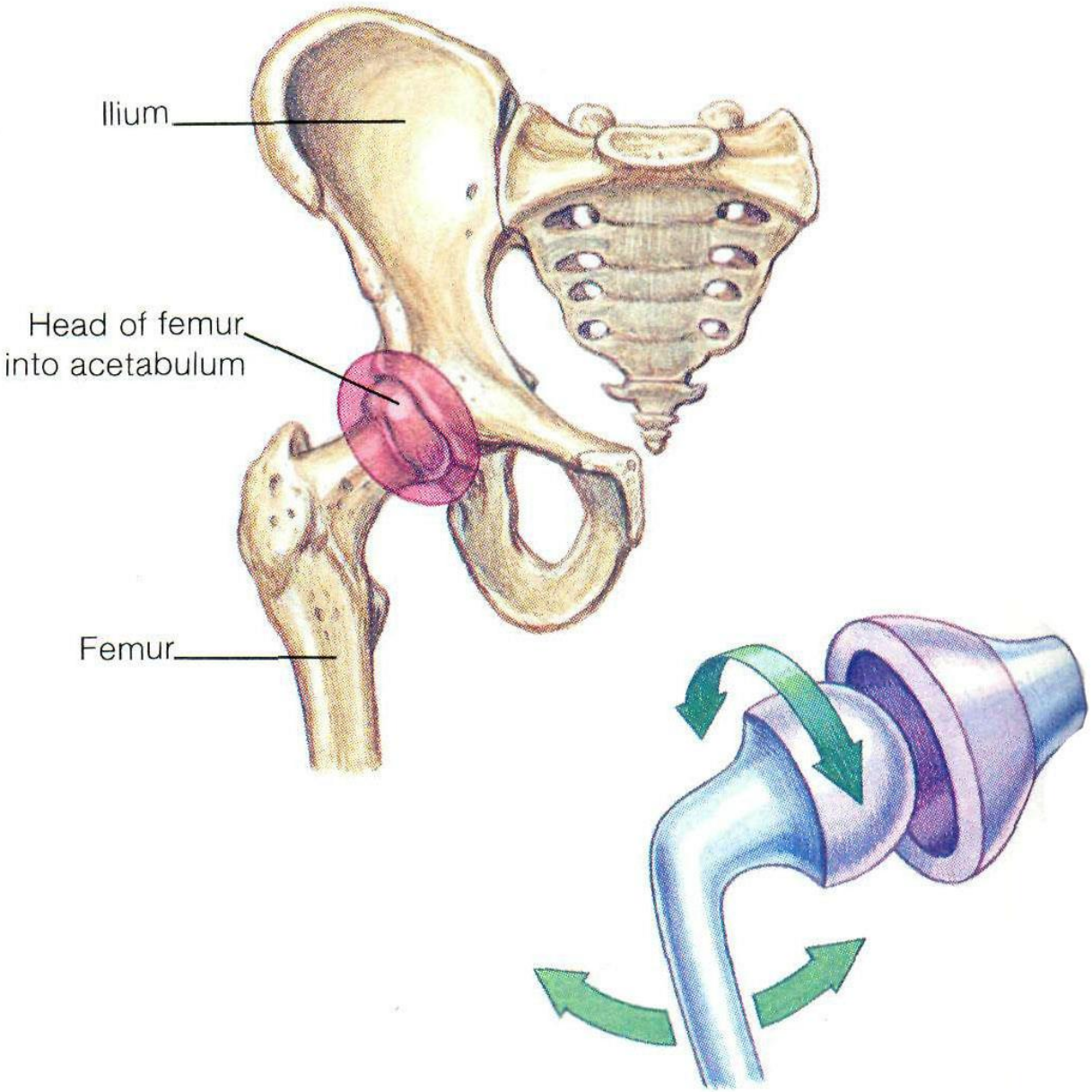

Phalanges
First metacarpal bone
Creek
Trapezium



Ball-and-socket

In these highly mobile joints, the spheroidal surface of one bone moves within the socket of another. An example is the *hip joint,* in which the spherical *head of the femur* rotates within the socket formed by the *acetabulum* of the hip bone.




Ilium
Head of femur into acetabulum
Femur

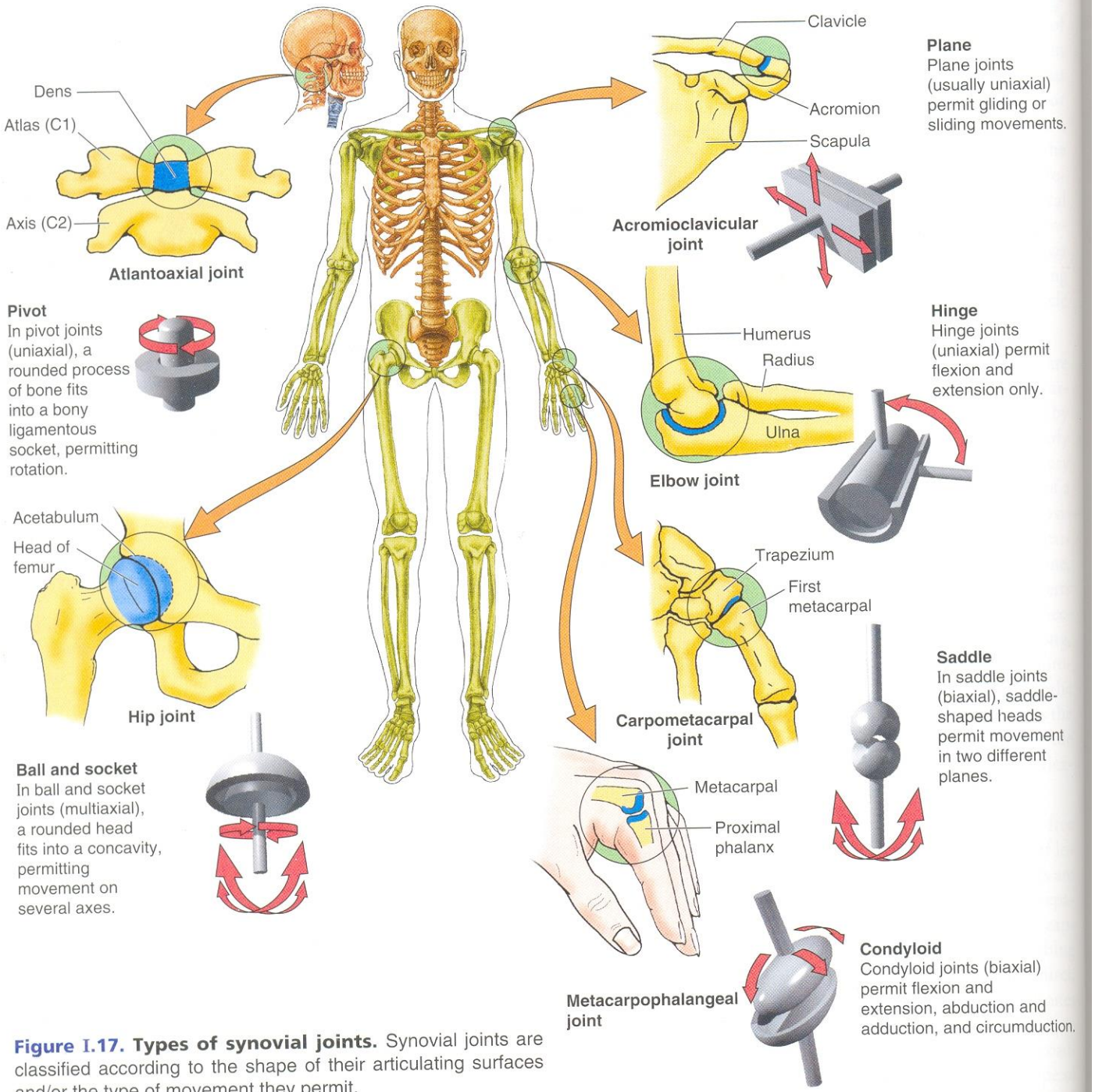
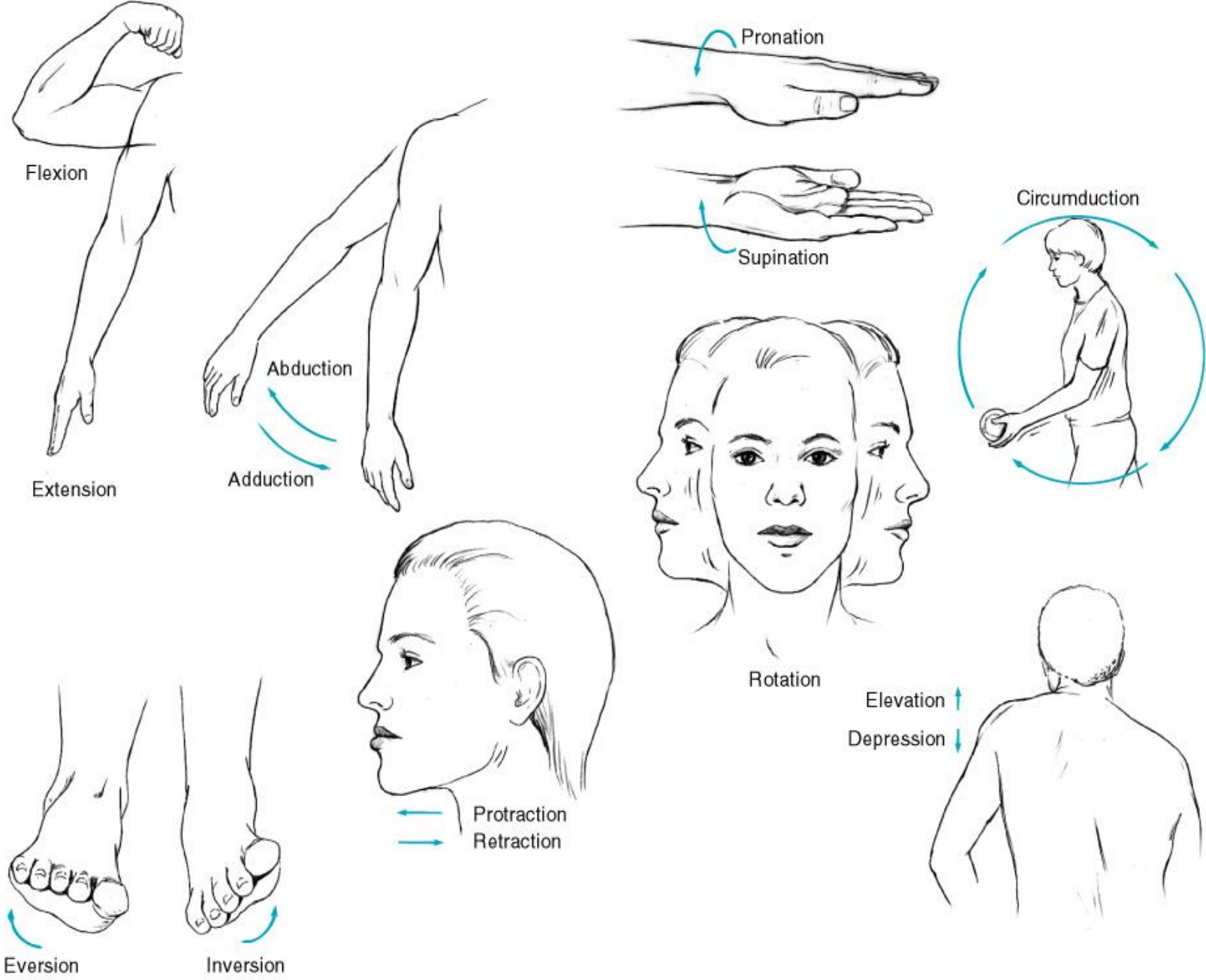


Figure I.17. Types of synovial joints. Synovial joints are classified according to the shape of their articulating surfaces and/or the type of movement they permit.

Joint motion - a review of terms

- Flexion
- Extension
- Dorsiflexion
- Plantar flexion
- Adduction
- A**b**duction
- Inversion
- Eversion
- Internal rotation
- External rotation
- Pronation
- Suppination

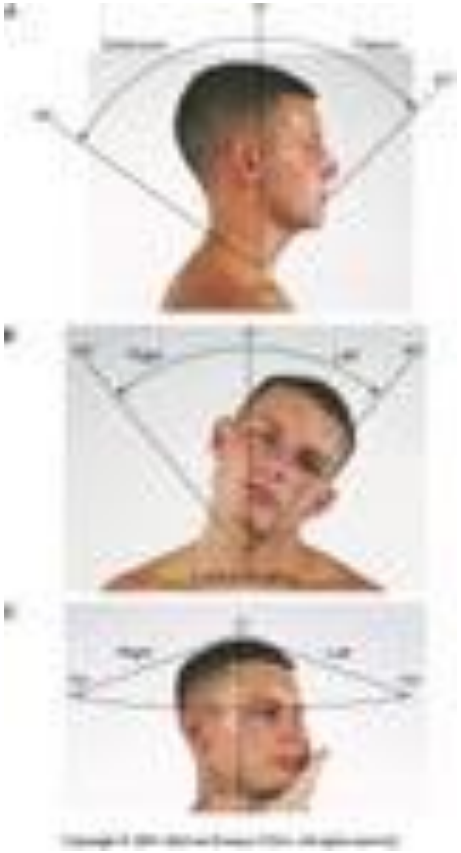


SKELETAL MUSCLE MOVEMENTS

Measuring Range of Motion

- If any limitation or increase in ROM is noted, use a _____ to measure the angles precisely

Cervical Spine Assessment



- Abnormal findings
  - H
  - A
  - T

Upper Extremity Assessment

- Abnormal findings:
  - L
  - P
  - S
  - M
  - A
  - C

ROM of wrist & hand

Flexion –

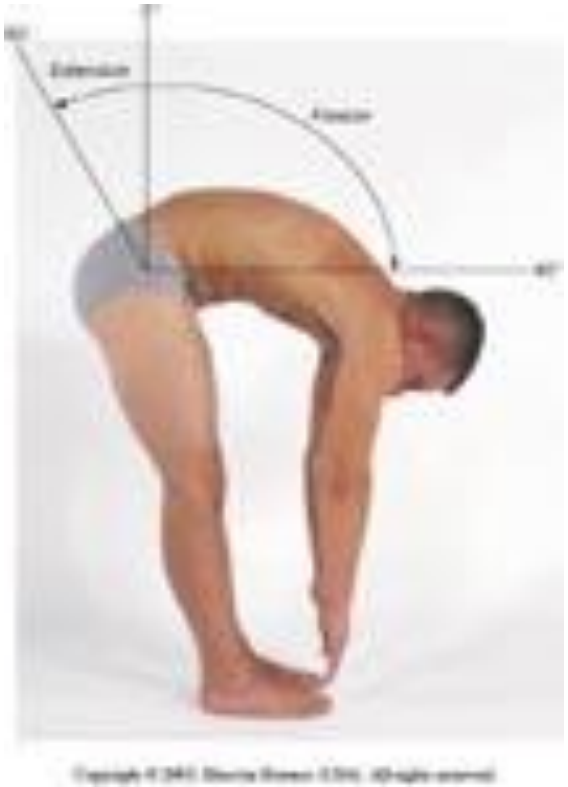
Extension –

Hyperextension –

Ulnar deviation –

Radial deviation –

Spinal Assessment



- Abnormal findings:
  - S
  - T
  - S

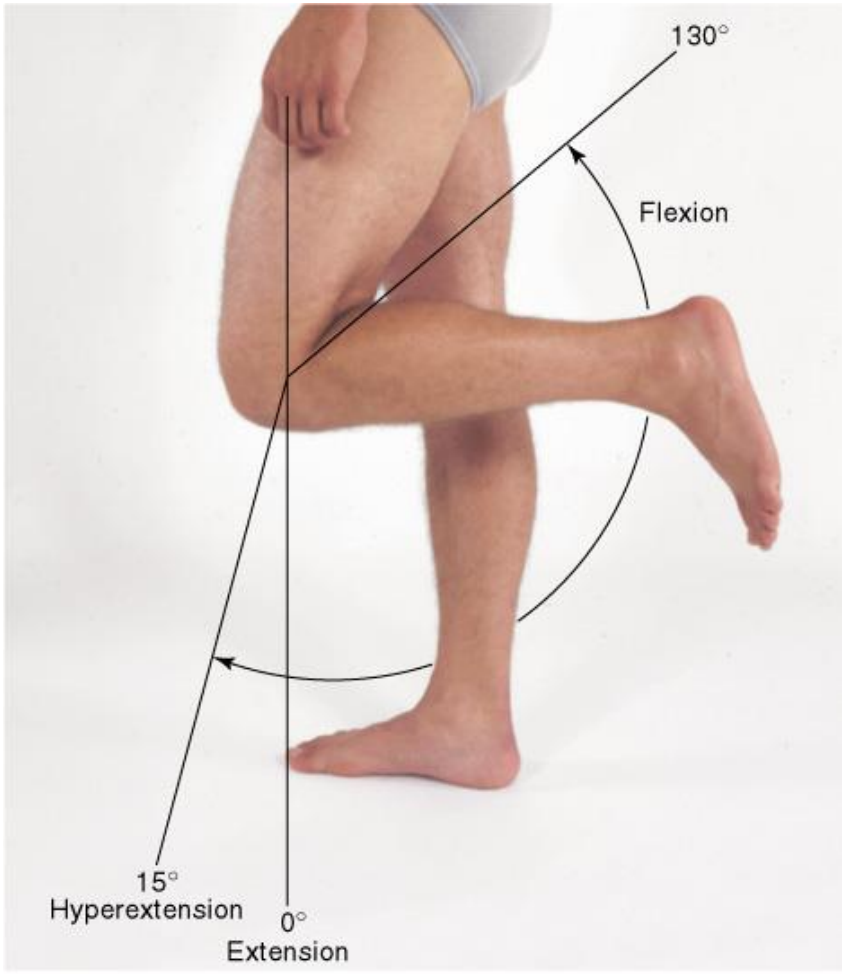
Torso Range of Motion

- Abnormalities:
  - L
  - P

Lower Extremity ROM

- Hip flexion with knee straight –
- Hip flexion with knee flexed:
- Internal & External rotation :
- Abduction :
- Adduction :

Range of Motion of the Knee



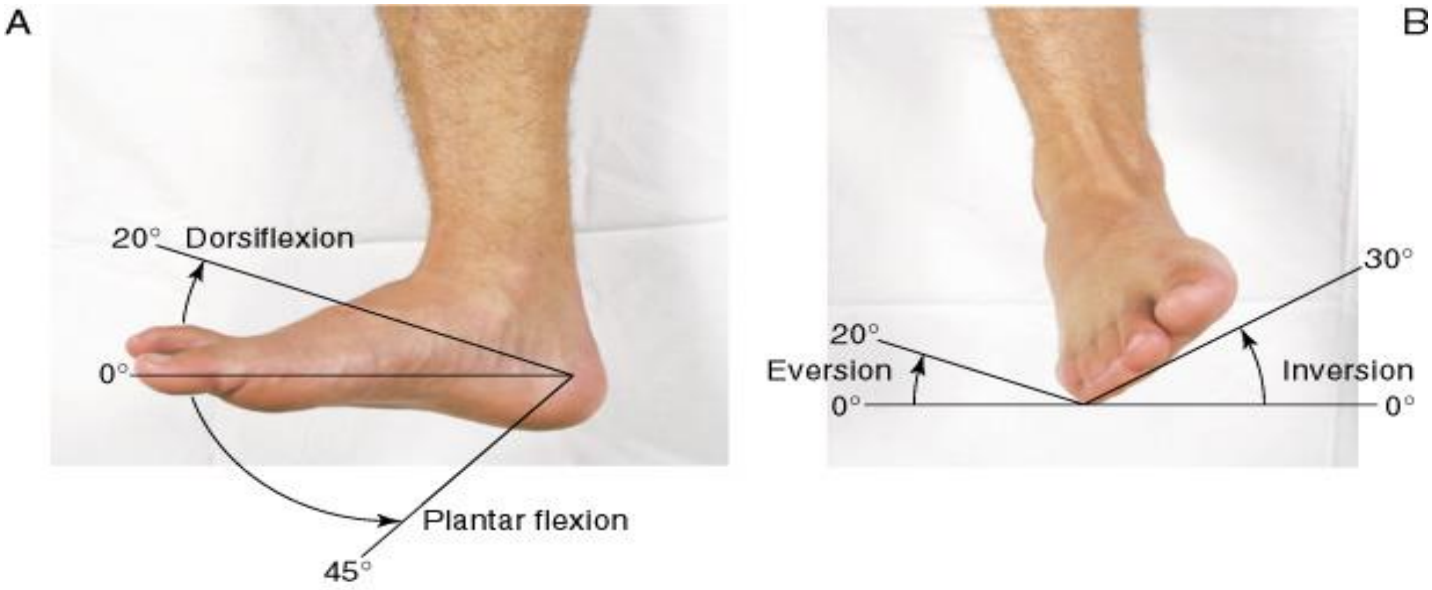
- Flexion-extension – 135^0
- Hyperextension - 10^0

Ballottement

- Used to test for joint effusion
- If there is an effusion present a palpated tap will be present and the transmitted impulse will be felt by the fingers on either side of the patella

Ankle Range of Motion

- Dorsiflexion – 20^{o}
- Plantar Flexion – 50^{0}
- Inversion of hind foot – 5^{0}
- Eversion of hind foot - 5^{0}



Movements at synovial joints are broadly classified as angular and circular. These movements are produced by the contraction of muscles crossing the joints and attaching to or near the bones forming the articulations.

Angular Movements

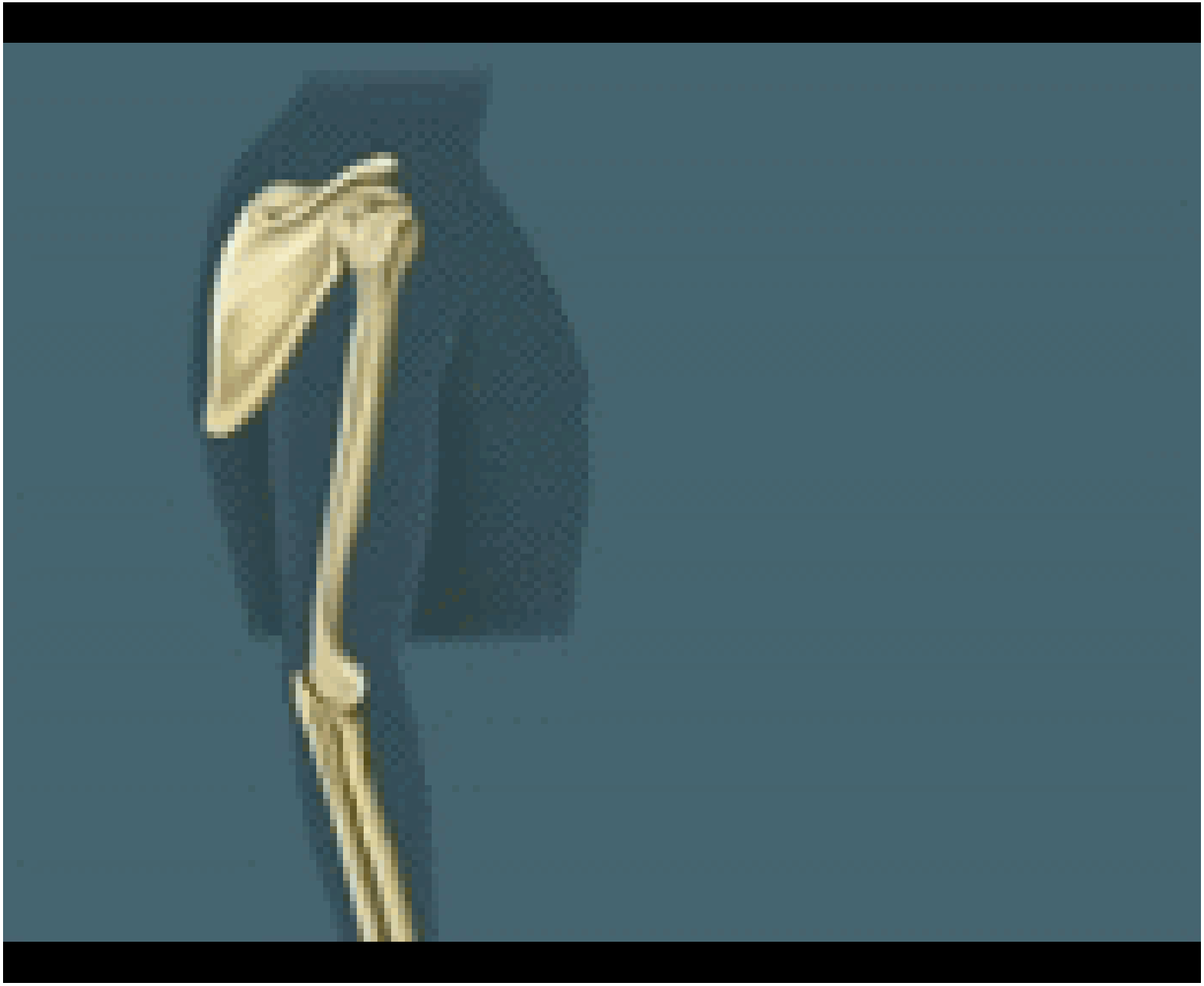
Angular movements increase or decrease the joint angle produced by the articulating bones.

The four types of angular movements are flexion, extension, abduction, and adduction.

Flexion

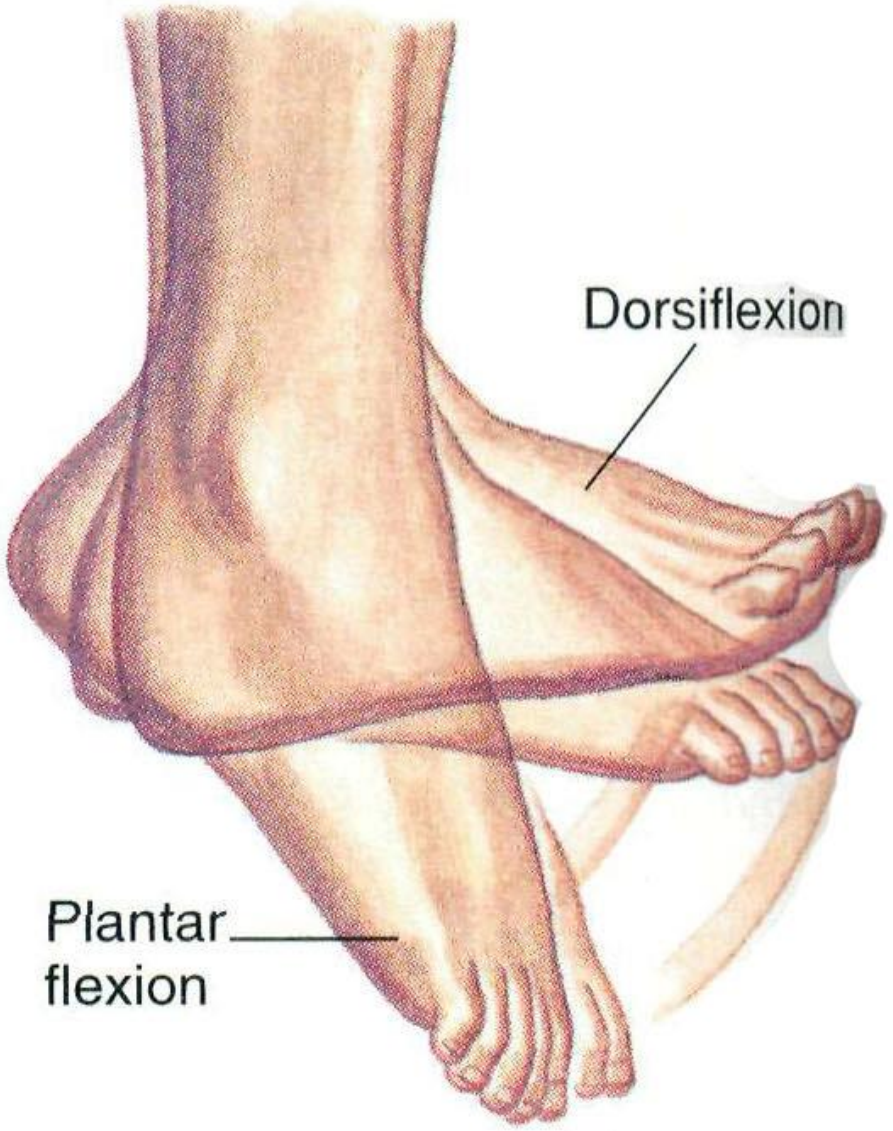
Flexion is a movement that decreases the joint angle on an anterior-posterior plane.

Examples are bending the elbow or knee.



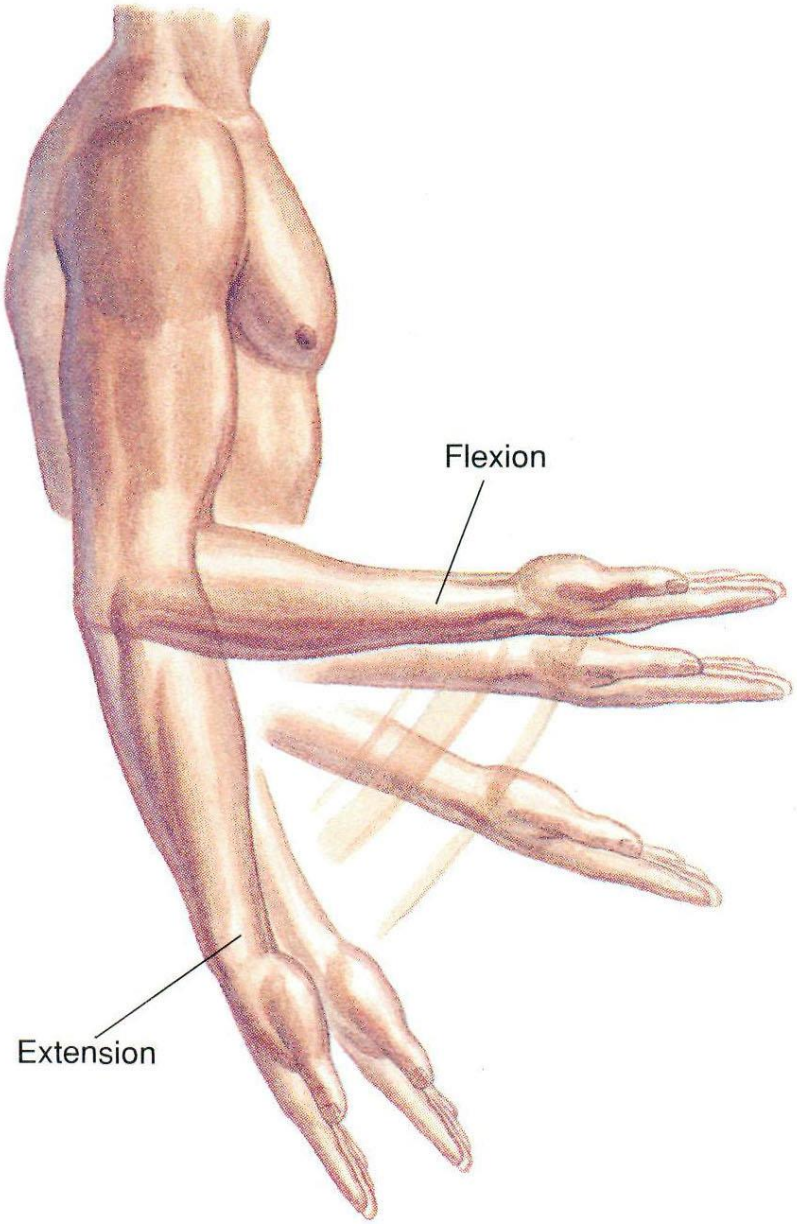
In the ankle joint, flexion occurs as the top surface of the foot is elevated.

This movement is frequently called dorsiflexion. Pressing the foot downward is called plantar flexion.


Dorsiflexion
Plantar
flexion

Extension

In extension, which is the reverse of flexion, the joint angle is increased. Extension returns a body part to the anatomical position. In an extended joint, the angle between the articulating bones is 180°. An exception is the ankle joint, in which a 90° angle already exists between the foot and leg.

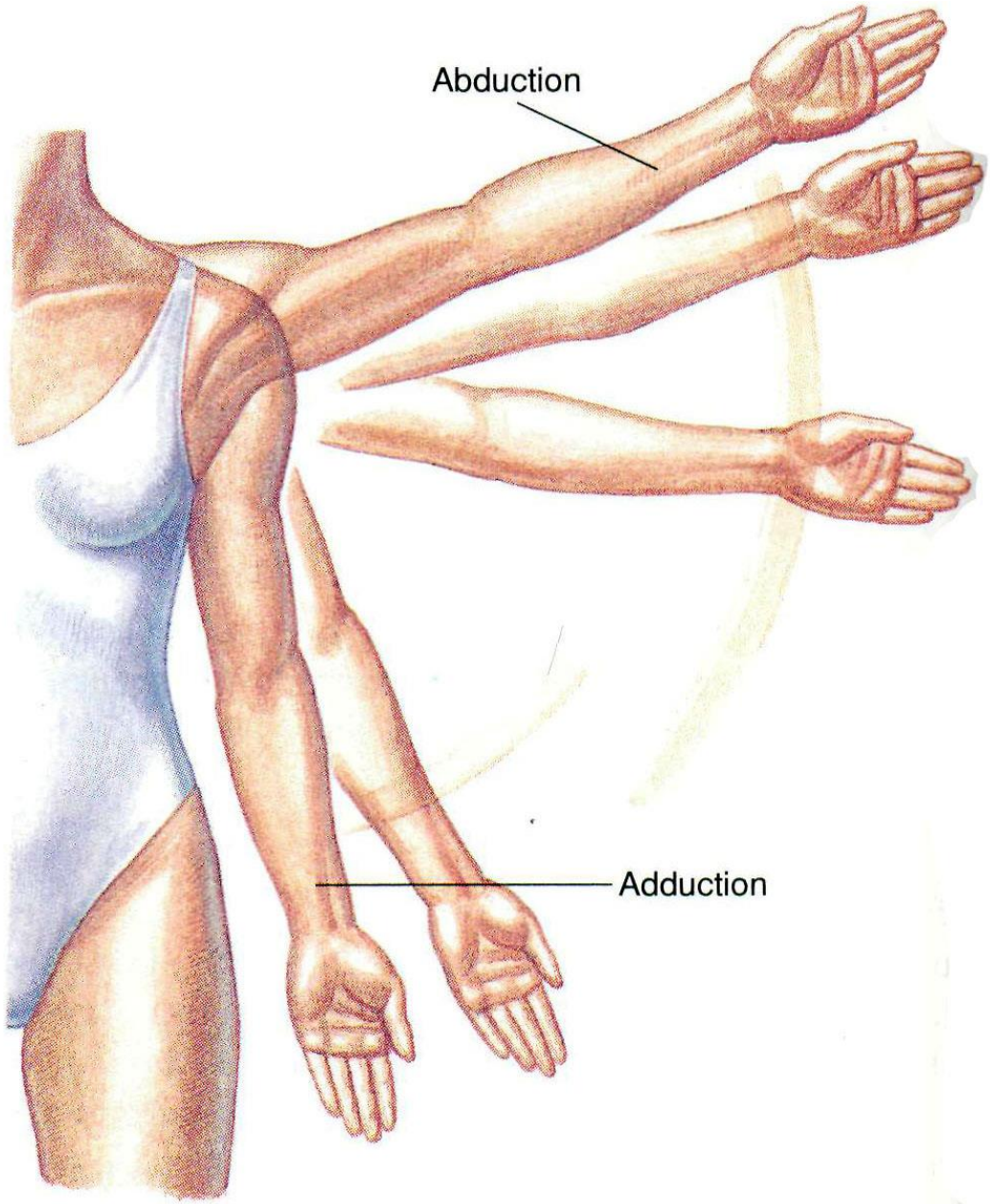

Flexion
Extension

Abduction

Abduction is the movement of a body part away from the main axis of the body, or away from the midsagittal plane, in a lateral direction.

Adduction

Adduction, the opposite of abduction, is the movement of a body part toward the main axis of the body. In the anatomical position, the arms and legs have been adducted toward the midplane of the body.


Abduction
Adduction

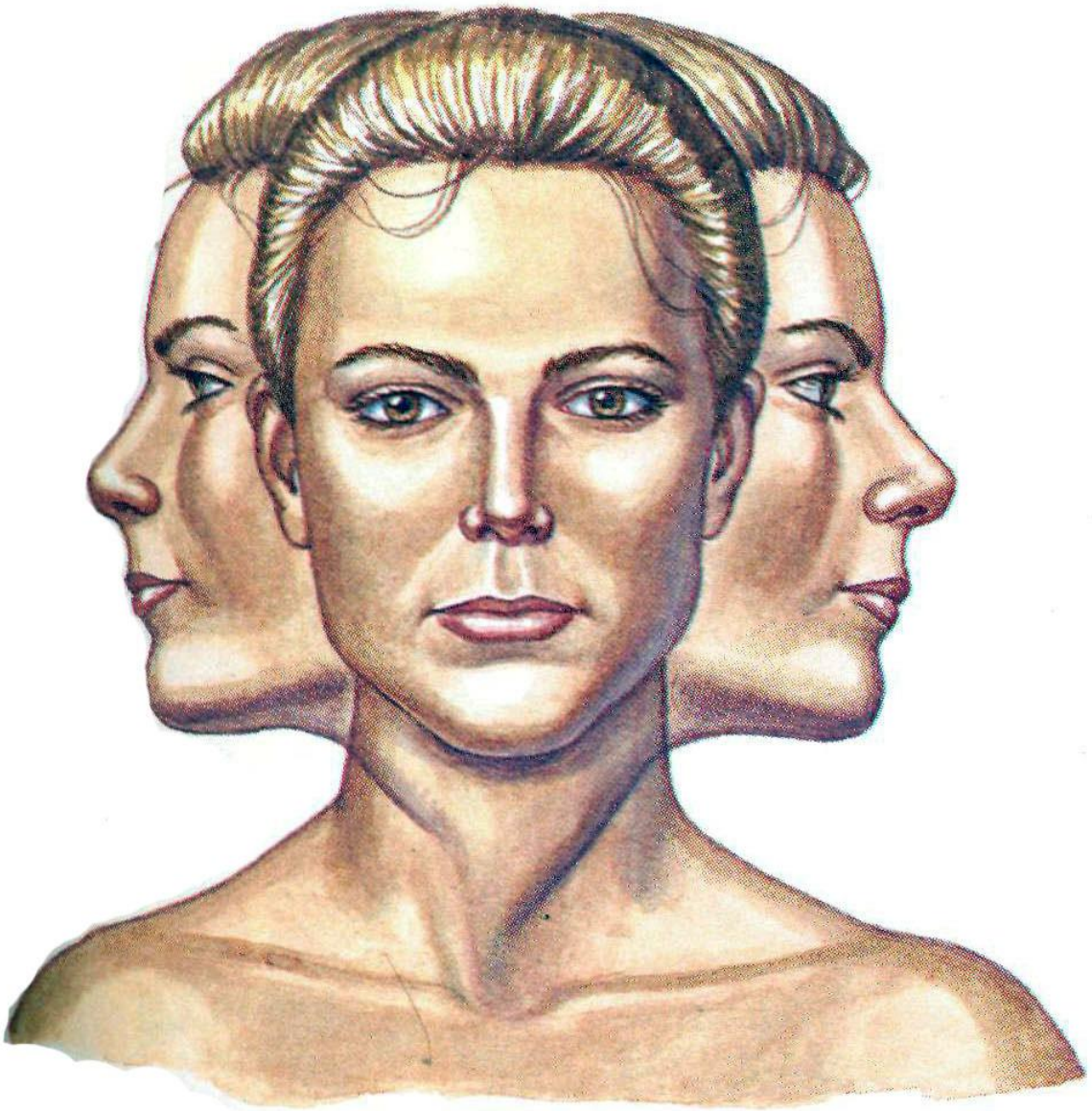
Circular movements

Joints that permit circular movement are composed of a bone with a rounded or oval surface that articulates with a corresponding depression on another bone. The two types of circular movements are rotation and circumduction.

Rotation

Rotation is the movement of a bone around its own axis.

Examples are turning the head from side to side.



Supination

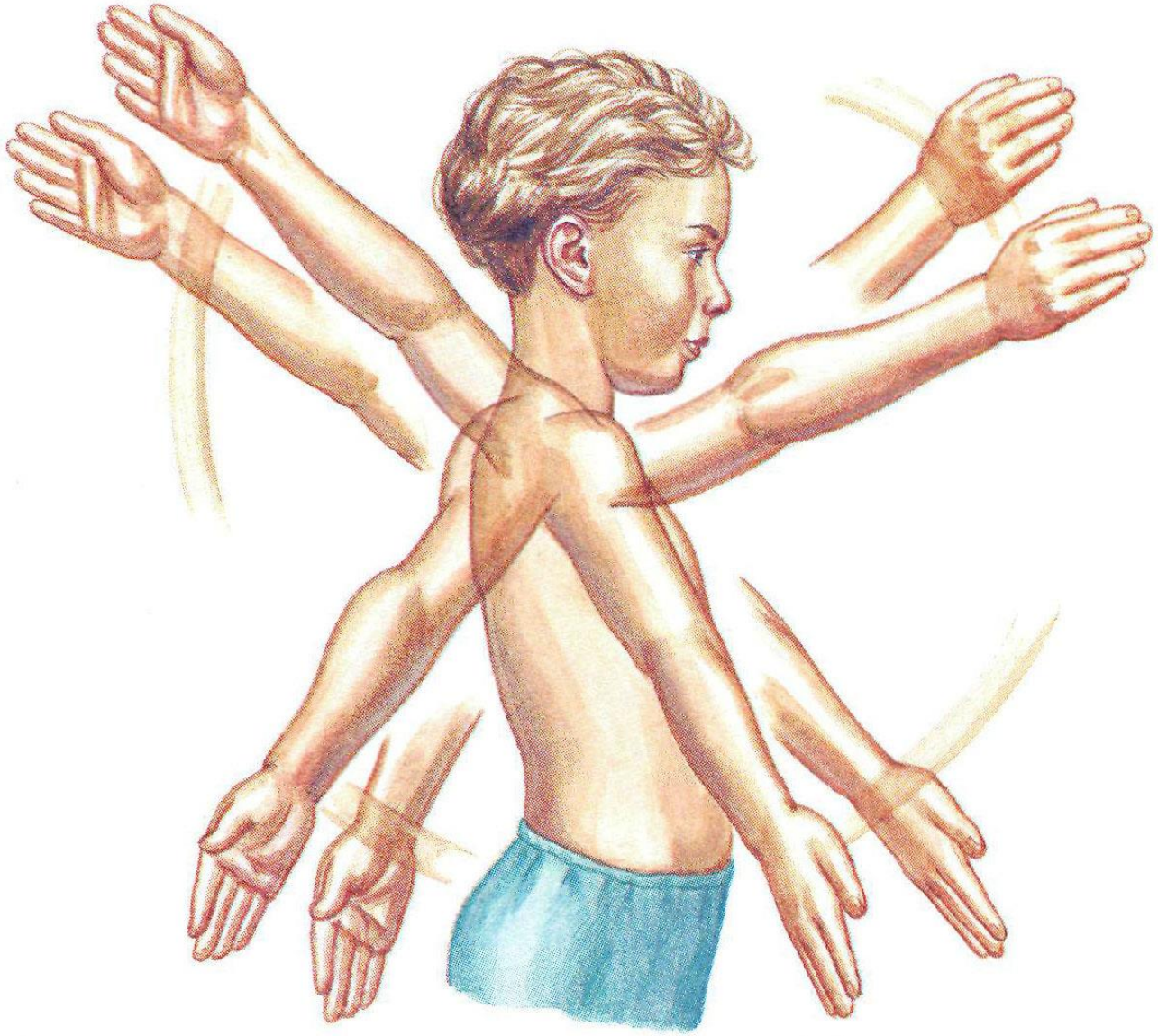
Supination is a specialized rotation of the forearm that results in the palm being turned forward (anteriorly). In the supine position, the ulna and radius of the forearm are parallel and in anatomical position.

Pronation

Pronation is the opposite of supination. It is a rotational movement of the forearm that results in the palm being directed backward (posteriorly).

Circumduction

Circumduction is the circular movement of a body part so that a cone-shaped airspace is traced. The distal extremity performs the circular movement, and the proximal attachment at the joint serves as the pivot .

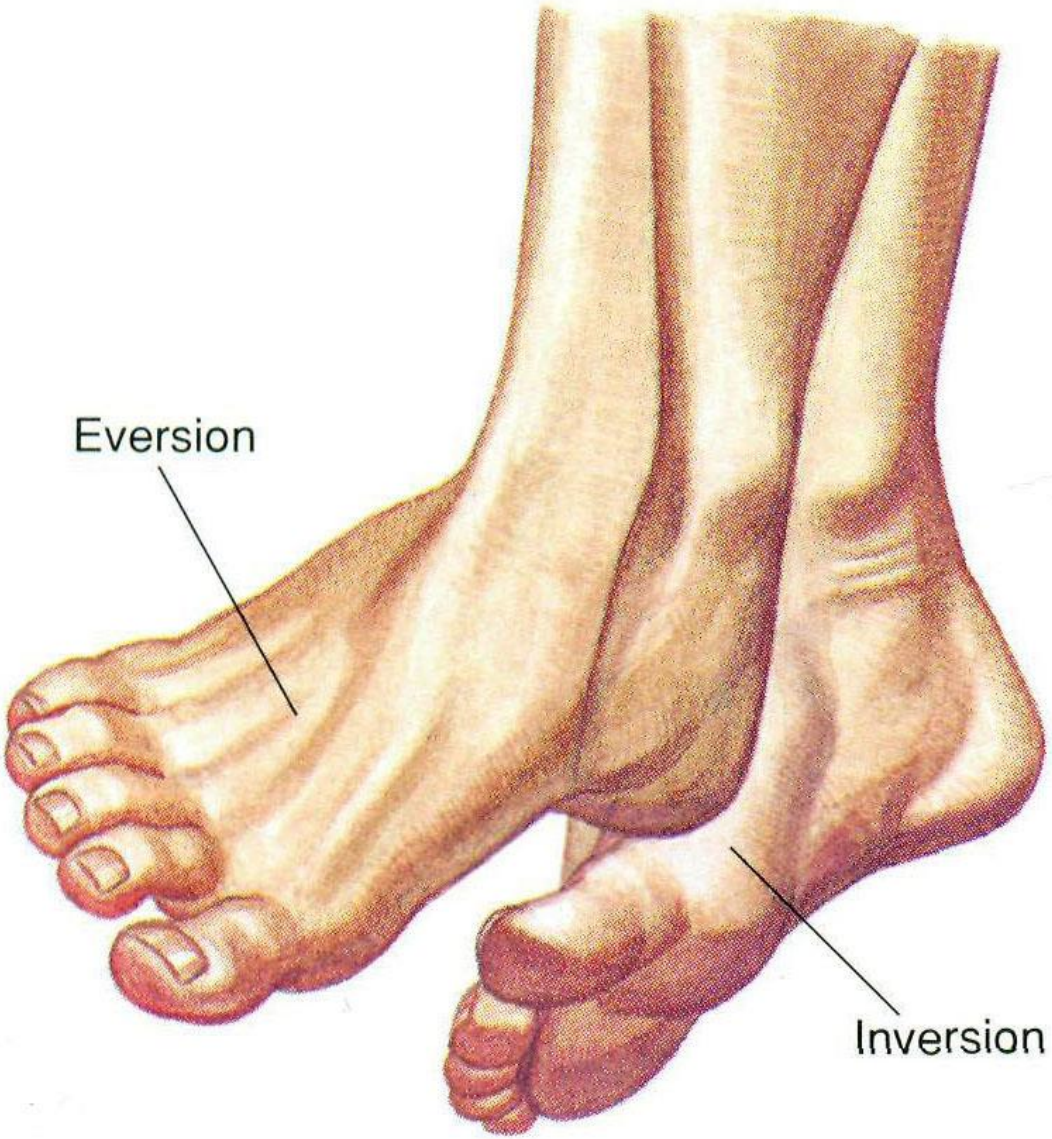


Special Movements

Because the terms used to describe most movements around an axis do not apply to all joints, other terms must be used.

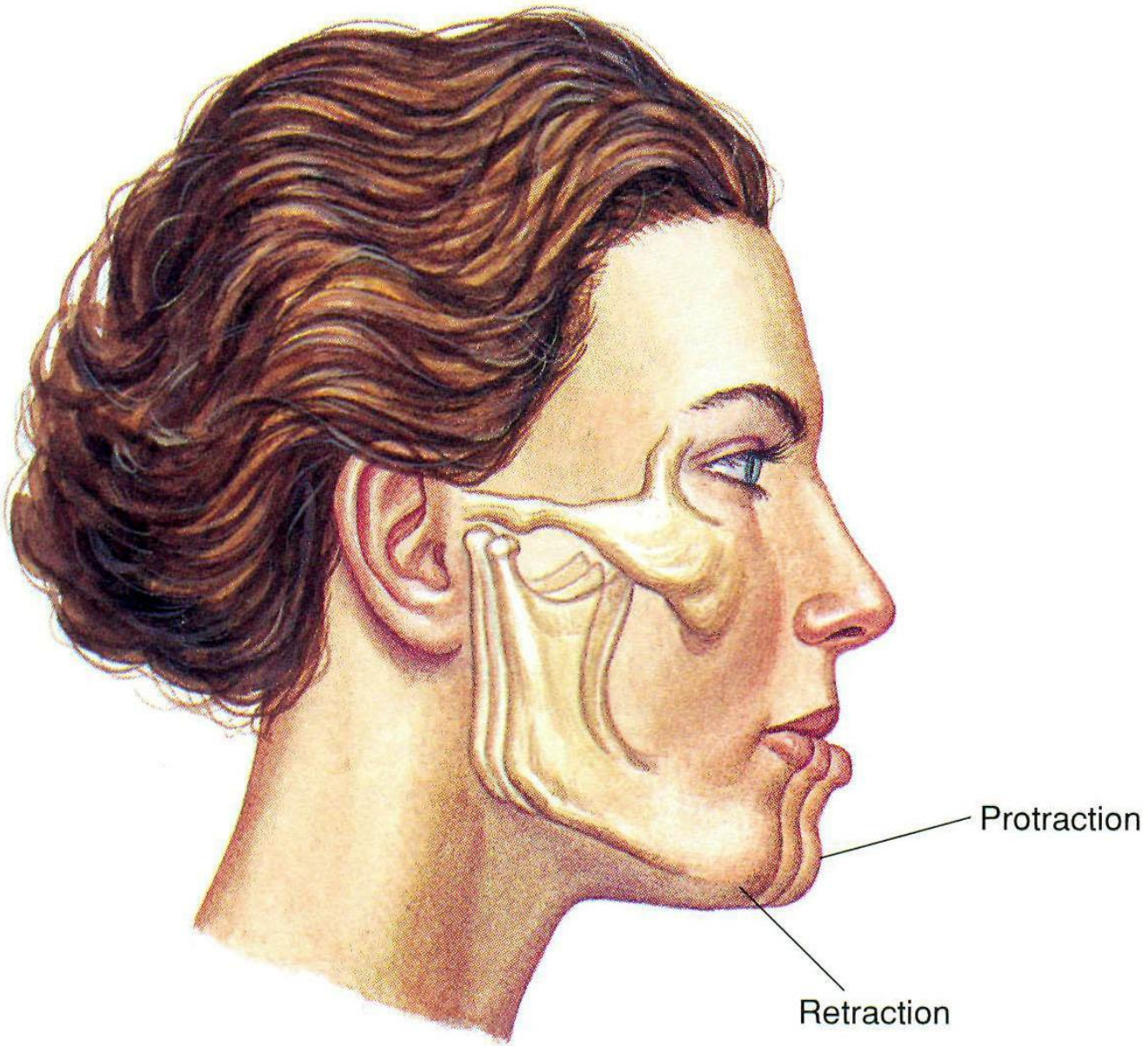
Inversion is the movement of the sole of the foot inward or medially.

Eversion, the opposite of inversion, is the movement of the sole outward or laterally.


Eversion
Inversion

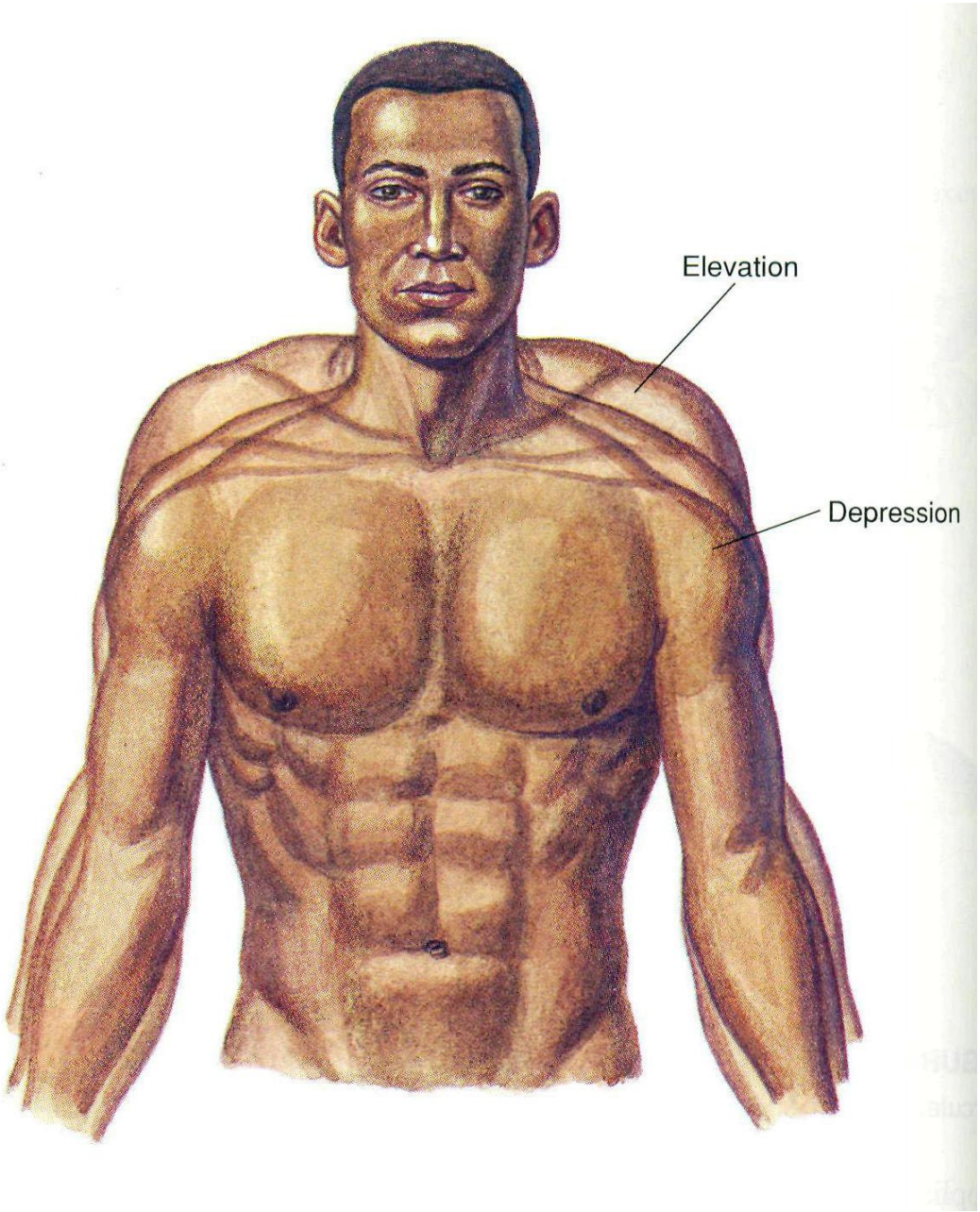
Protraction is the movement of part of the body forward on a plane parallel to the ground, such as the thrusting out of the lower jaw .

Retraction is the opposite of protraction and is the pulling back of a protracted part of the body on a plane parallel to the ground.


Protraction
Retraction

Elevation is a movement that raises a body part. Examples include elevating the mandible to close the mouth and lifting the shoulders to shrug .

Depression is the opposite of elevation.


Elevation
Depression

THE END

Joints

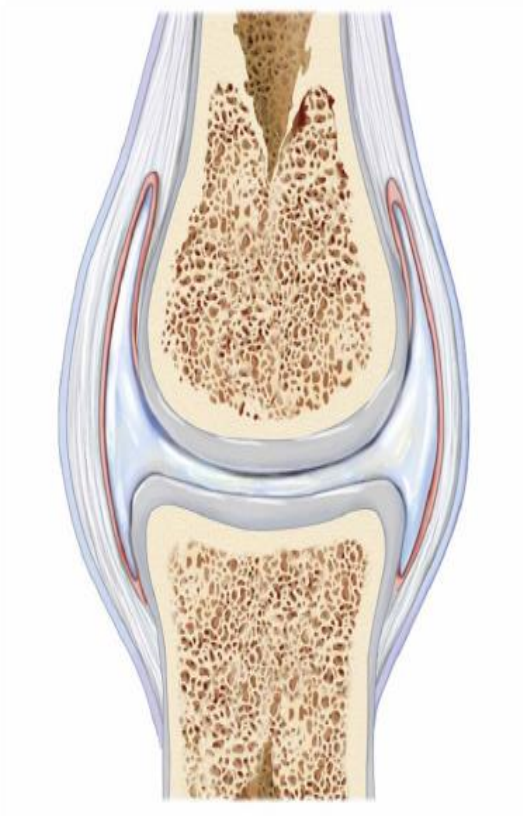
- Formed where two bones meet
- Also called an **articulation**
- Three types based on movement allowed between the 2 bones:
  - **Synovial**
  - **Cartilaginous**
  - **Fibrous**

Synovial Joints

- Freely moving joints
- Most common type of joint
- Example is ball-and-socket joint
- Bones held together by **ligaments**
  - Strong bands of connective tissue
- Some contain a **bursa**
  - Sac-like structure lined with synovial membrane

Synovial Joints

- Enclosed in an elastic **joint capsule**
- Contains **synovial fluid**
  - Lubricant secreted by **synovial membrane**
- Ends of bones are covered with **articular**

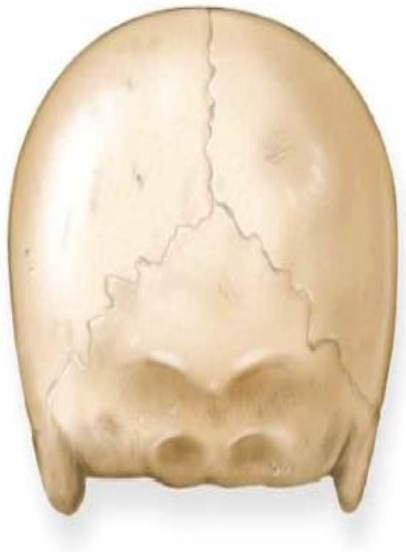


Cartilaginous Joints

- Allow slight movement
- Hold bones firmly in place by solid piece of cartilage
- Example
  - Pubic symphysis

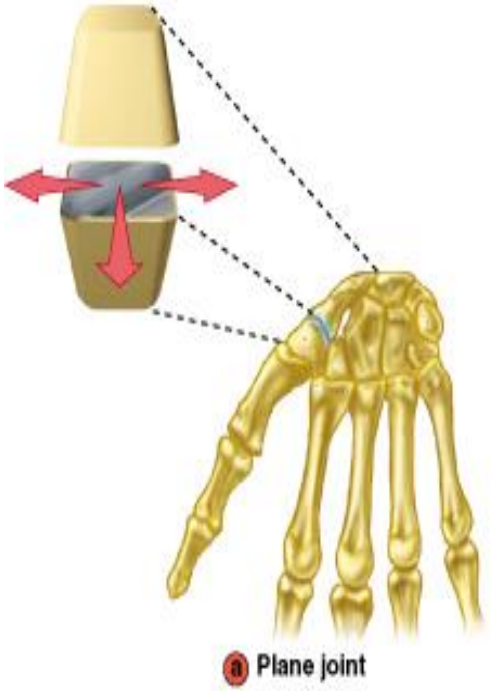
Fibrous Joints

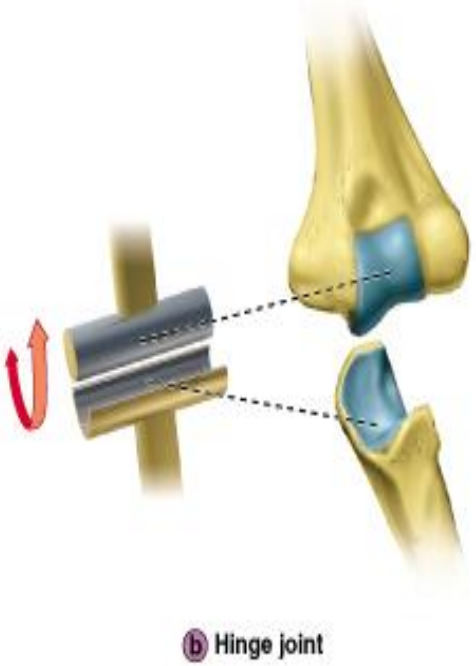
- Allow almost no movement
- Joined by thick fibrous tissue
- Example
  - Sutures of the skull



Types of Synovial Joints

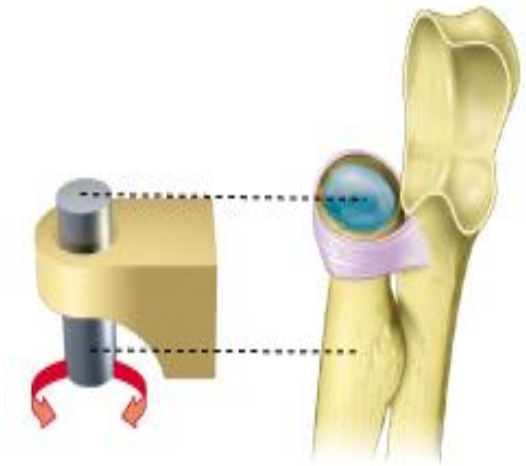
1. Plane joints
   - Articular surfaces are flat and allow short slipping or gliding movements.
   - Intercarpal and intertarsal joints
2. Hinge joints
   - A cylindrical projection of one bone fits into a trough-shaped surface on another (like a hotdog in a bun)
   - Movement resembles a door hinge.
   - Elbow joint – ulna

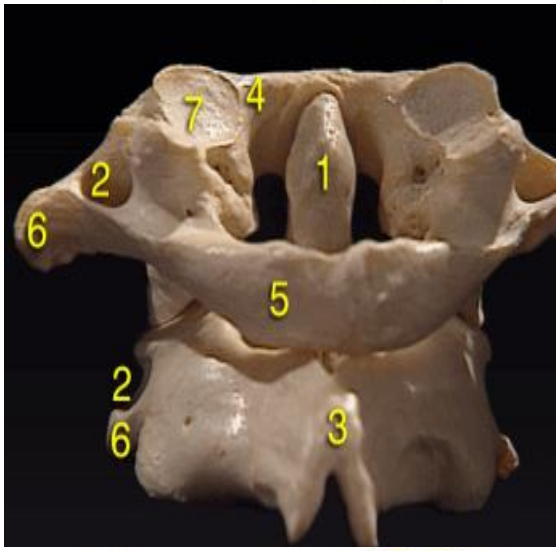


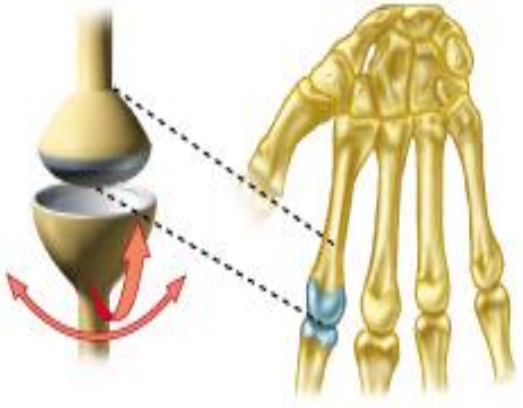


Type of Synovial Joints

3. Pivot joints
   - Rounded end of one bone protrudes into a ring formed by another bone or by ligaments of that bone.
   - Proximal radioulnar joint
   - Atlas-axial joint
4. Condyloid joints
   - Oval articular surface of one bone fits into a complementary depression on another.
   - Radiocarpal joints
   - Metacarpophalangeal joints



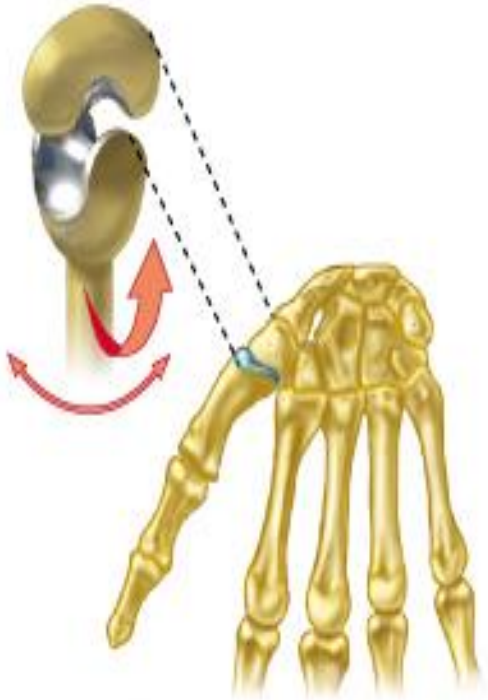




Types of Synovial Joints

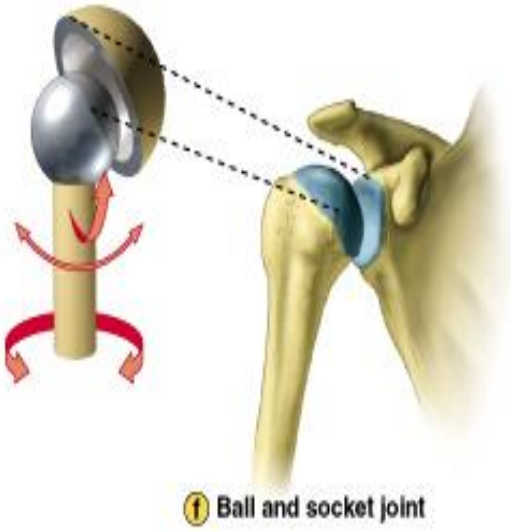
5. Saddle joints

- Each articular surface has convex and concave areas. Each articular surface is saddle-shaped.
- Carpometacarpal joints of the thumbs.



6. Ball-and-Socket joints

- Spherical or semi-spherical head of one bone articulates with the cuplike socket of



Joints between bones of the trunk

Joints between bones of the Vertebral Column

- 1. joints between bodies of vertebra;
- 2. joints between arches of vertebra;
- 3. joints between processes of vertebra.
- **Joints between bodies of vertebra. Type:synchondrosis.**

- **Joints between bodies of vertebra.**
- **Type:synchondrosis.**
- Intervertebral disks are situated between adjacent superior and inferior surfaces of bodies of the vertebrae from C2 to sacrum.

- Fibrous connective tissue (**type: syndesmosis**) units the all parts of vertebrae with the help of 2 long ligaments: **the anterior longitudinal ligament** covers anterior surface of vertebrae from C2 to sacrum; the **posterior longitudinal ligament** in vertebral canal on posterior surface of vertebrae from C2 to sacrum.

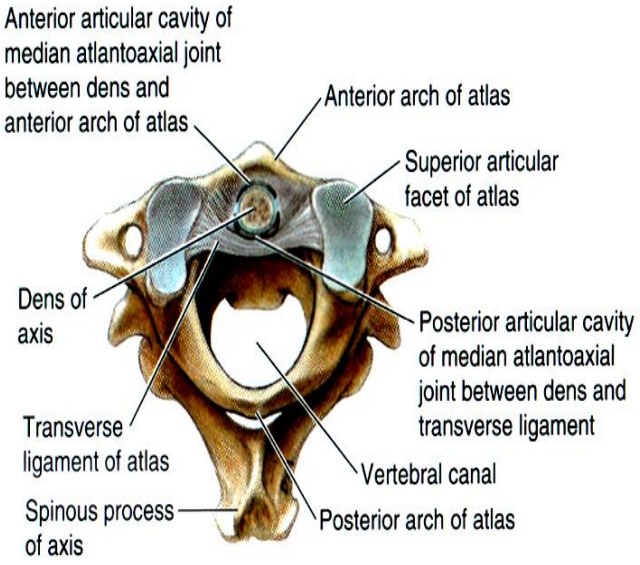
- **Joints between arches of vertebra. Type: syndesmosis.**
- Short ligament is the **ligamenta flava**. The ligamenta flava consists of yellow elastic tissue, the fibers of which are attached to the vertebral arches.

- **Joints between processes of vertebra.**
- 1). Between spinous and transverse processes. **Type: syndesmosis**
- The **supraspinal ligament** connects together the tops of the spinous process. The **intertransverse ligaments** are between the transverse processes. The **interspinal ligaments** connect spinous process.

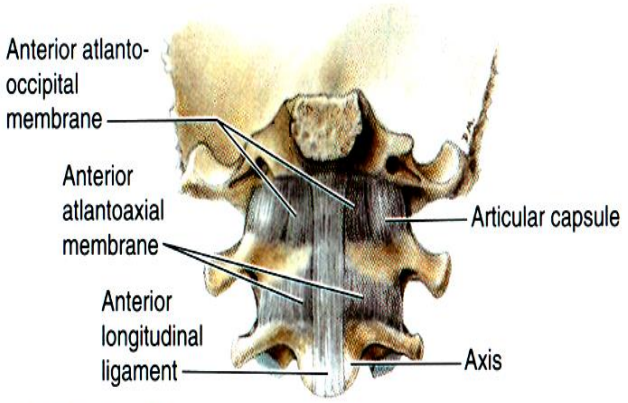
Between the vertebral articular processes.
Type: diarthrosis (synovial joint).

- Articulatio intervertebralis (zygapophysialis)
- The essential features of the intervertebral articulation (zygapophysial) are:
- facies articularis: facies articulares of the superior articular process and inferior articular process. Articulatio intervertebralis is simplex, combinate. It is

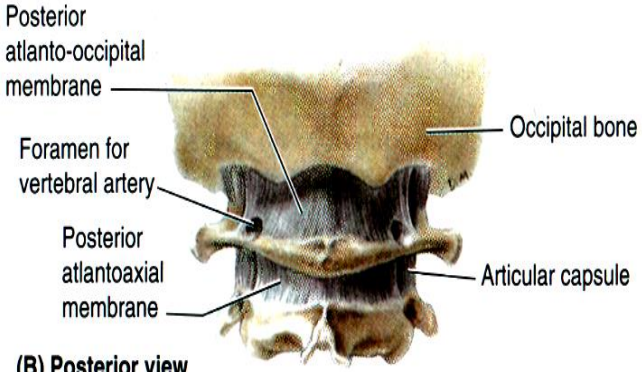
- **Joints between atlas and axis** consists of a medial and two lateral joints.
- Articular surfaces of articulatio atlantoaxialis mediana: dens of axis, anterior arch and transverse ligament of atlas.
- Articular surfaces of articulatio atlantoaxialis lateralis: inferior articular surfaces of atlas and superior articular surfaces of axis.



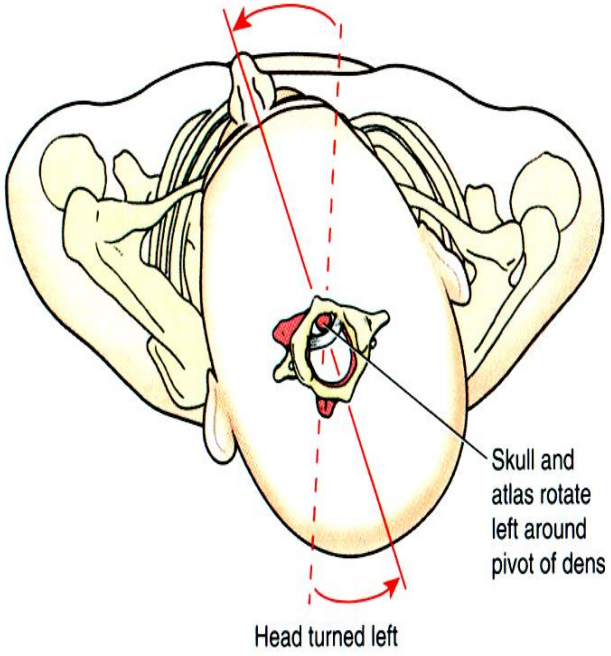
(C) Superior view



(A) Anterior view



(B) Posterior view

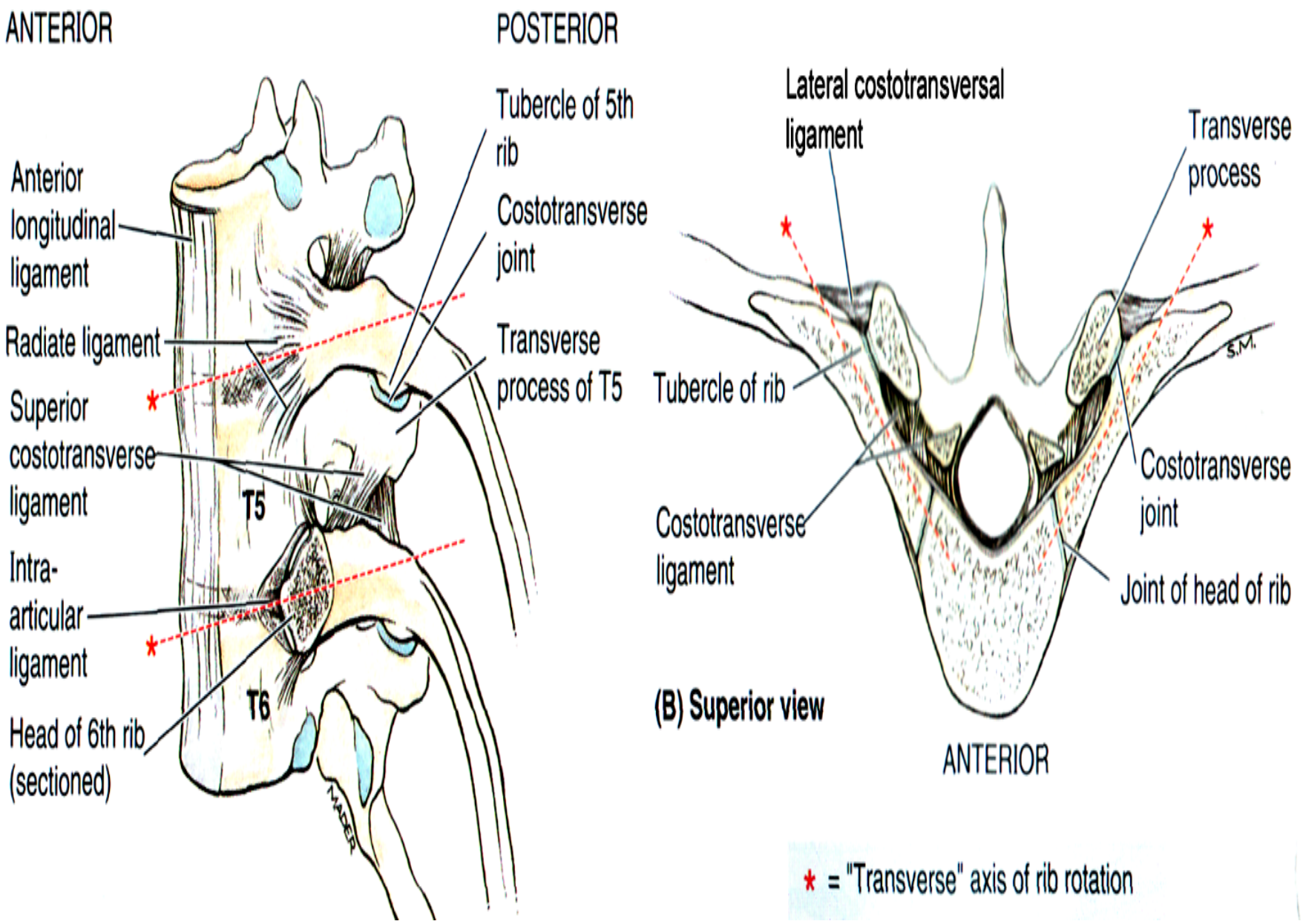


- **Joints between atlas and occipital bone – Articulatio atlantooccipitalis**
- **Articular surfaces of:** condyles of occipital bone and superior facets of atlas
- **Type:** condyloid, simplex, combinated.
- **Movements:** flexion, extension, and lateral motion (adduction)

- **Joints between ribs and vertebrae**

1). Articulations of the head of the rib (Articulatio costovertebralis, L.). Articular surfaces of Costovertebral joints –**:** head of rib and superior and inferior facet on side of vertebral body.

- **Type:** Spheroidal. Simplex(1, 11, 12), complicated (1-10). Combinated.


ANTERIOR
POSTERIOR
Anterior longitudinal ligament
Radiate ligament
Superior costotransverse ligament
Intra-articular ligament
Head of 6th rib (sectioned)
Tubercle of 5th rib
Costotransverse joint
Transverse process of T5
T5
T6
MACER
Lateral costotransversal ligament
Transverse process
Tubercle of rib
Costotransverse ligament
Costotransverse joint
Joint of head of rib
S.M.
(B) Superior view
ANTERIOR
* = "Transverse" axis of rib rotation

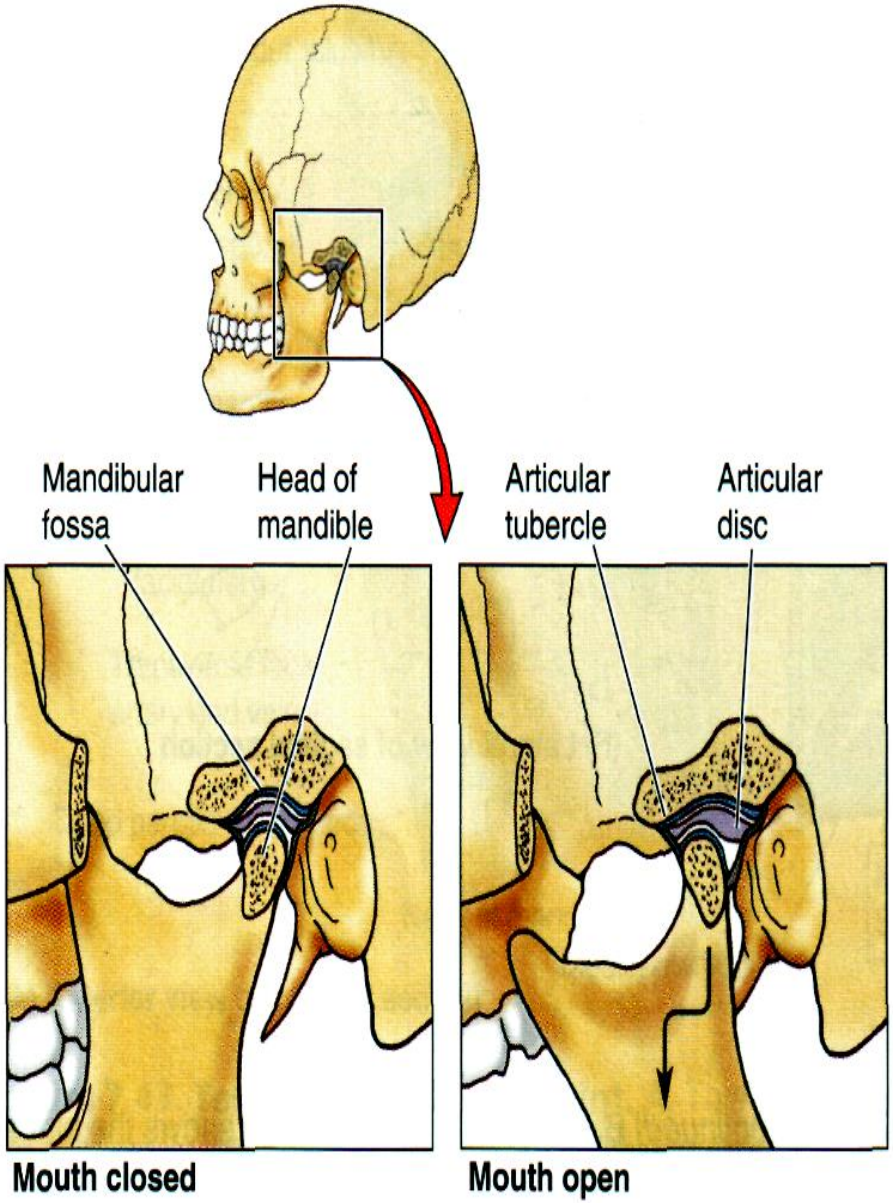
- 2). Costotransverse joints (Articulatio costotransversaria, L.) between tubercle of rib and transverse process of the vertebra.
- **Articular surfaces of:** tubercle of Th1-10 ribs with transverse process of vertebrae.
- Articular capsule attached to edges of articular facets.
- **Type:** Plane. Simplex. Combinated.
- **Movement of ribs:** gliding and total effect is a rotation of head of rib in its own axis

- **Sternocostal joints**
- 1). Between first rib and sternum (Synchondrosis costae primae, L.)
- **Type:** Permonent synchondroses: bones united by cartilage tissue
- 2). Between sternum and ribs from 2 to 7 (Articulatio sternocostales, L.).
- **Articular surfaces of:** cartilages of 2-7 ribs and costal notches of sternum
- **Type:** Spheroidea. Simplex. Combinated.
- **Movements:** gliding
- 3). Interchondral between costal cartilages of ribs 8 to 10 join together at adjacent articular facets. The articulations are plane synovial joints.
- The cartilages of 11 and 12 ribs do not join with sternum. Because according classification – 11, 12 ribs are floating.

- **Joints between bones of the skull**
- Bones of the skull are jointed due to synarthroses (sutures, and synchondroses). Only lower jaw forms articulation with temporal bone.

- **Temporomandibular joint** (Articulatio temporomandibularis, L.).
- **Articular surfaces of:** mandibular fossa and the articular tubercle of the temporal bone and the head of the mandible.
- **Articular Disc.** This is an oval disc of fibrocartilage. The disc permits gliding movement in the upper part of the joint and hinge movement in the lower part of the joint.

- **Articular Disc.** This is an oval disc of fibrocartilage. The disc permits gliding movement in the upper part of the joint and hinge movement in the lower part of the joint.
- **Type:** Elypsoid. Simplex. Complex.


Mandibular fossa
Head of mandible
Articular tubercle
Articular disc
Mouth closed
Mouth open

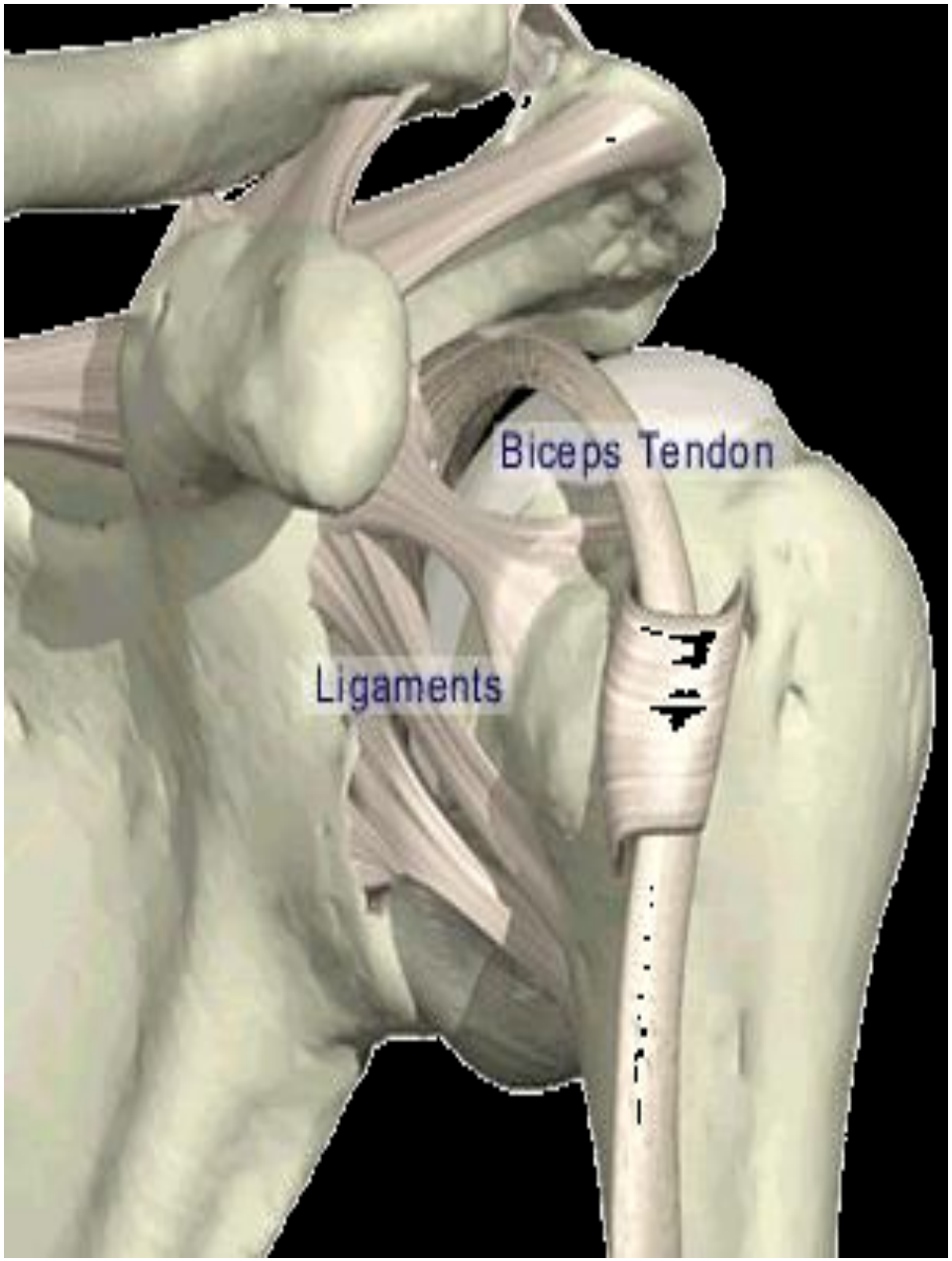
Joints of the upper limb

- **Joints of the sholder girdle**
- **Sternoclavicular joint** (Articulatio sternoclavicularis, L.).
- **Articular surfaces of:** sternal end of clavicle with clavicular notch of manubrium of the sternum and articular disk. Articular disk between sternum and clavicle. **Type:** Plane. Simplex. Complex. Combinated.
- **Movements:** elevation and depress; circumduction.

- **Acromioclavicular joint** (Articulatio acromioclaviculare, L.).
- **Articular surfaces of:** acromial end of clavicle and acromion of scapula.
- **Type:** Plane. Simplex. Combinated.
- **Movement:** gliding, rotation of scapula on clavicle.

- **Joints of the free upper limb**
- **Shoulder joint** (Articulatio humeri, L)
- **Articular surfaces of:** head of humerus and glenoid cavity of scapula.

- **Type:** Spheroidal (Ball-and-socket). Simplex.
- **Movements:** flexion, extension, abduction, adduction, medial rotation, lateral rotation, and circumduction.

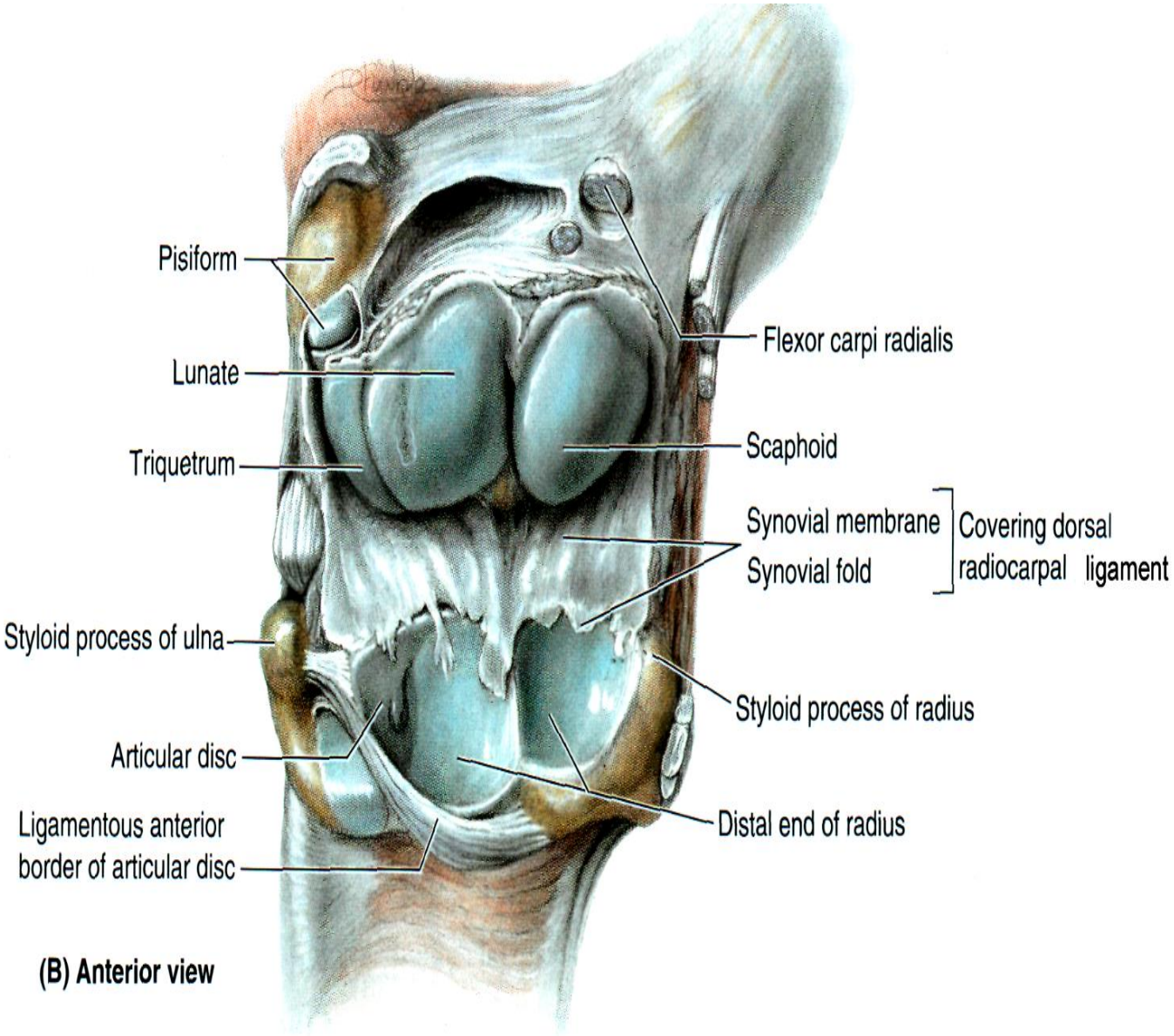

Biceps Tendon
Ligaments

Elbow joint (Articulatio cubiti, L)

- Consist of 3 joints: humeroulnar, humeroradial and proximal radioulnar
- I. Humeroulnar joint (Articulatio humeroulnaris, L.)
- **Articular surfaces of:** trochlea of humerus with trochlear notch of ulna
- **Type:** hinge (ginglymus). Simplex.
- **Movements:** flexion and extension.
- II. Humeroradial joint (Articulatio humeroradialis, L.)
- **Articular surfaces of:** capitulum of humerus with fovea of radial head.
- **Type:** Spheroidea. Simplex. Combinated.
- **Movement:** gliding.

•III. Radioulnar proximal (Articulatio radiulnaris proximalis, L.)
•**Articular surfaces of:** head of radius and radial notch of ulna.
•**Type:** Pivot. Simple. Combinated.
•**Movements:** pronation and supination of forearm
•**Type of elbow joint in general:** (hinge). Complicated.
•**Movement:** flexion and extension, pronation and supination of forearm with the movement in distal radioulnar joint.
The bodies of radius and ulna are jointed due to interosseal membrane (syndesmoses).
•**Radioulnar distal joint** (Articulatio radioulnaris distalis, L.)
•**Articular surfaces of:** head of ulna and ulnar notch of radius.
•**Type:** Pivot. Combinated.
•**Movements:** rotation (pronation, supination).

- **Wrist joint (radiocarpal articulation)** (Articulatio radiocarpalis, L.)**.**
- **Articular surfaces of:** distal radius and articular disk with proximal row of carpals bones.
- **Type:** Elypsoid. Complicated. Complex.


Pisiform
Lunate
Triquetrum
Styloid process of ulna
Articular disc
Ligamentous anterior border of articular disc
Flexor carpi radialis
Scaphoid
Synovial membrane
Synovial fold
Covering dorsal radiocarpal ligament
Styloid process of radius
Distal end of radius
(B) Anterior view

- **Intercarpal articulation** (Articulationes intercarpalis, L.)
- A. Articulations of carpals with each other: plane joints, amphyartrosis.
- B. Articulations between the 2 rows of carpals (the midcarpal joint): a plane joint, amphyartrosis.

- **Carpometacarpal joints** (Articulationes carpometacarpales, L.)
- A. Between first metacarpal and trapezium: a saddle joint, simplex, permitting flexion, extension, abduction, adduction, and opposition
- B. All others between distal row of carpals and bases of metacarpals: plane joints, amphyartrosis
- Intermetacarpal among bases of

- **Joints of the lower limb** (juncturae membri inferioris)
-
- Joints are divided into:
- - **Joints of the pelvis** (juncturae cinguli pelvici);
- - **Joints of the free lower limb** (juncturae membri inferioris liberi).

pelvici) are divided into:

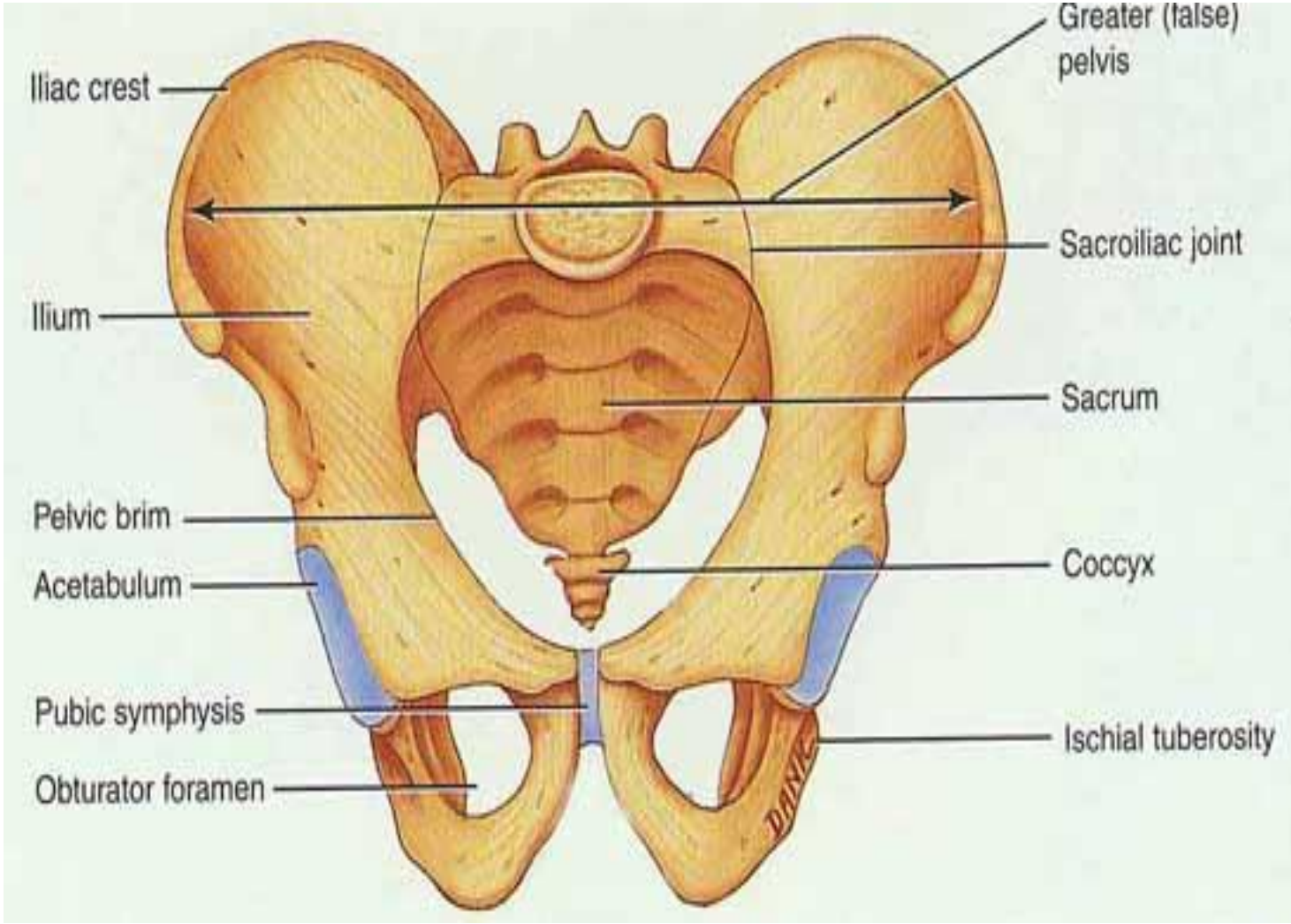
- syndesmoses cinguli pelvici;
- articulationes cinguli pelvici;
- symphysis cinguli pelvis .

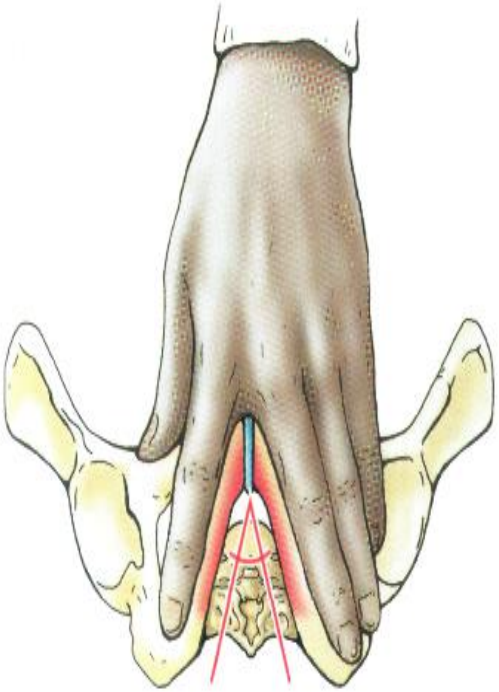
Bones of the pelvis joint by all types of joints: Syndesmoses, Synchondroses, Synostoses, Symphyses, Diarthrosis.

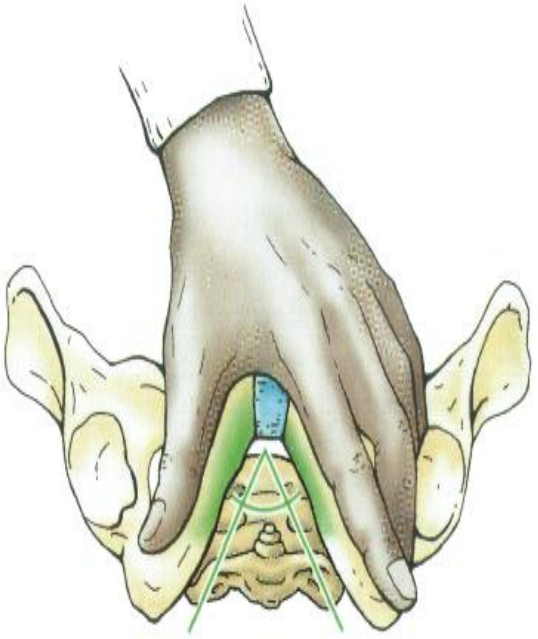
- Hip bone consist of iliac, pubic anb ischial bones, which are jointed by synchondrosis

(until 17-22 years) or synostosis(after 22 years).

- **syndesmoses cinguli pelvici are:**
- - membrana obturatoria, ligamentum sacrospinale, ligamentum sacrotuberale
- **symphysis** cinguli pelvici is symphysis pubica.
-


Iliac crest
Ilium
Pelvic brim
Acetabulum
Pubic symphysis
Obturator foramen
Greater (false) pelvis
Sacroiliac joint
Sacrum
Coccyx
Ischial tuberosity

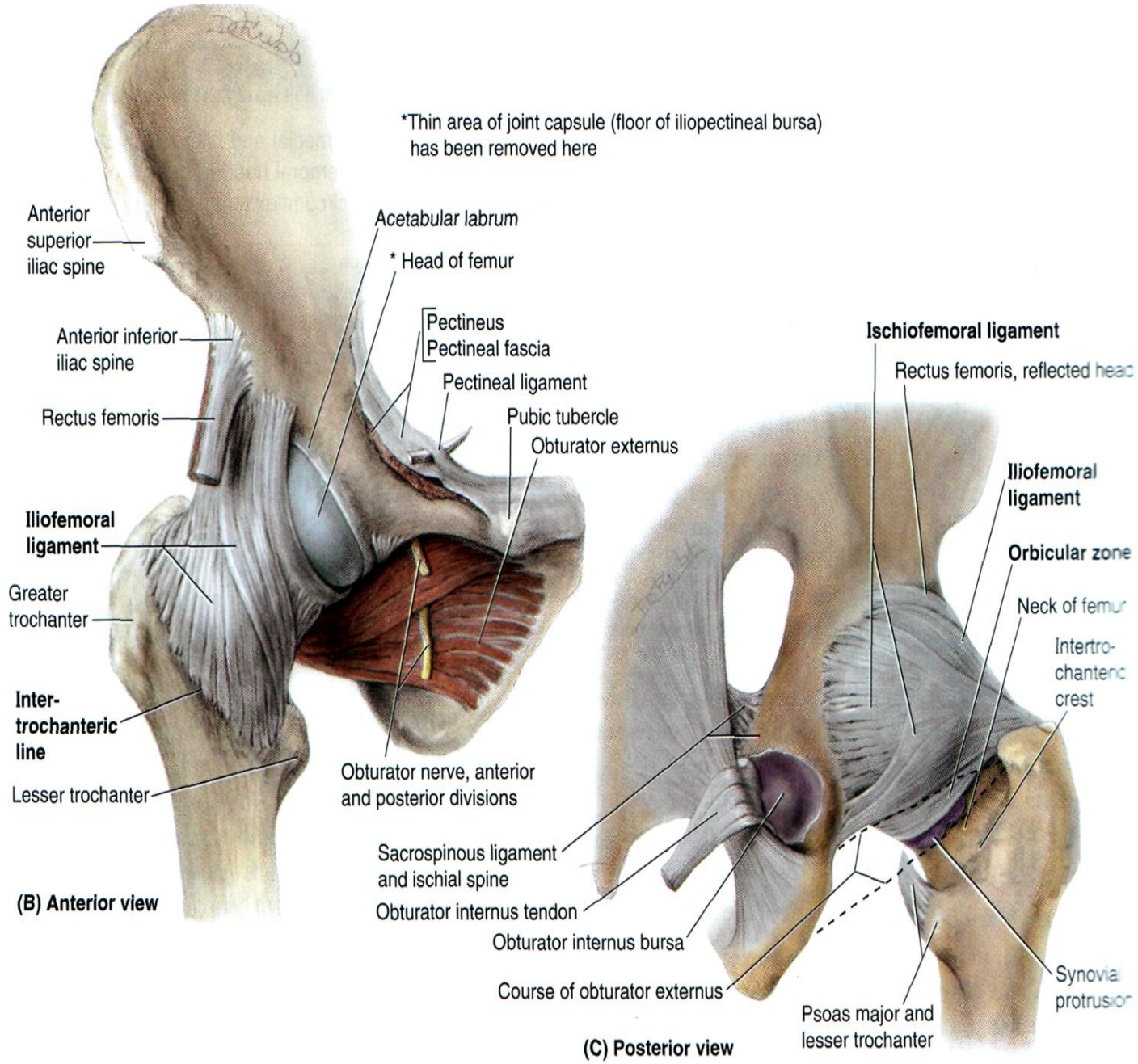




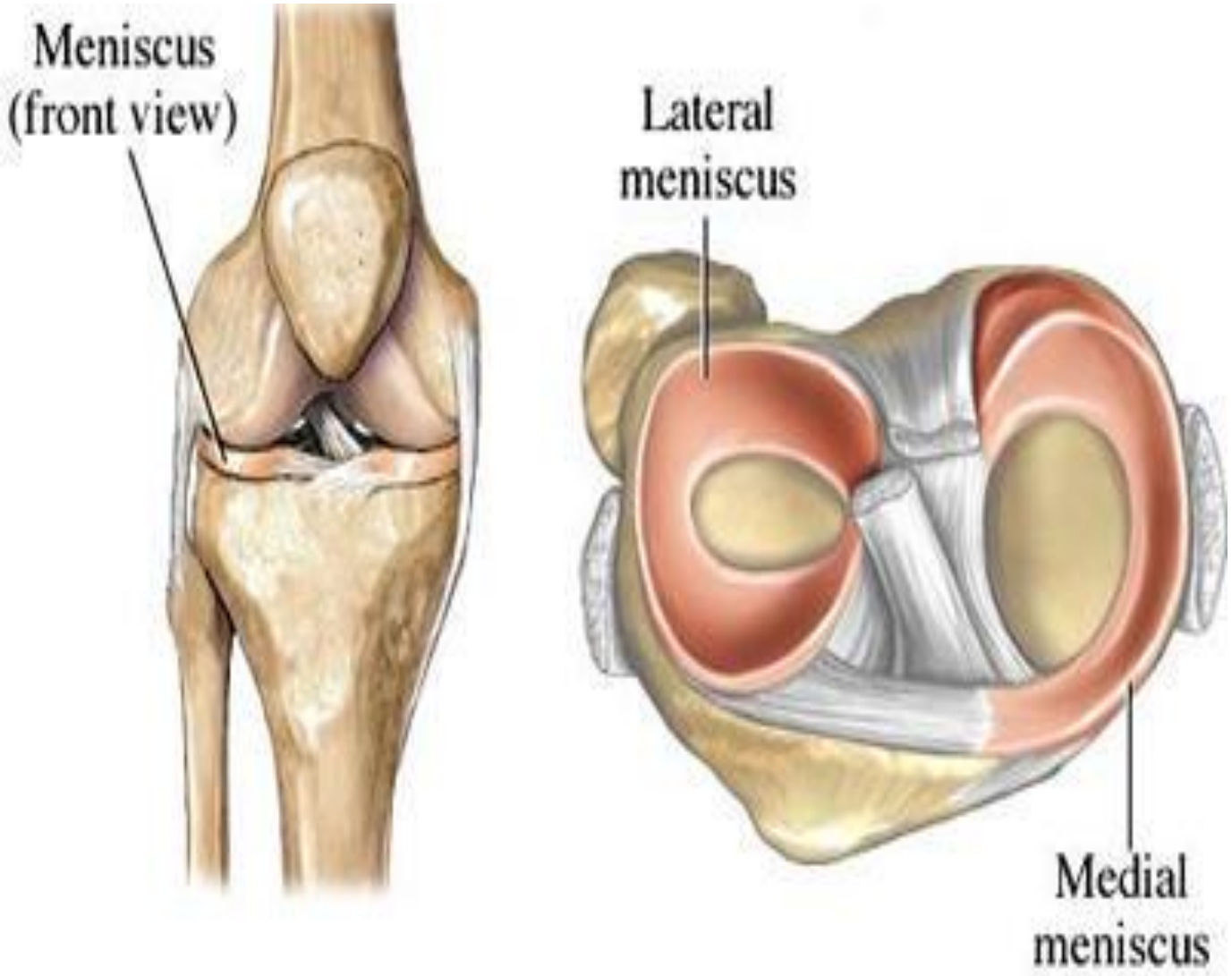
- **articulationes cinguli pelvici are paried articulationes sacroiliaca**.
- **Sacroiliac joint** (articulatio sacroiliaca)
- **Articular surface:** between auricular surface of sacrum and ilium
- **Type:** Plane, amphiarthrosis. Simplex. Combinated.

Joints of the free lower limb

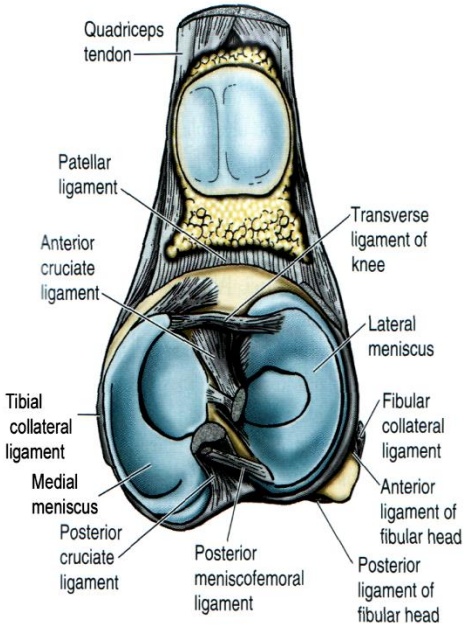
- **Hip Joint** (Articulatio coxae, L.)
- **Articular surface of:** head of femur and lunate surface of acetabulum of hip bone. Acetabular labrum (glenoid labrum) deepens acetabulum, helps to hold head of femur.
- **Type:** Ball and socket. Simple. Complex.
- **Movements:** flexion, extension, abduction, adduction, lateral (external) rotation, and medial (internal) rotation.


*Thin area of joint capsule (floor of iliopectineal bursa) has been removed here
Anterior superior iliac spine
Acetabular labrum
* Head of femur
Pectineus
Pectineal fascia
Anterior inferior iliac spine
Pectineal ligament
Rectus femoris
Pubic tubercle
Obturator externus
Iliofemoral ligament
Greater trochanter
Inter-trochanteric line
Lesser trochanter
Obturator nerve, anterior and posterior divisions
(B) Anterior view
Ischiofemoral ligament
Rectus femoris, reflected head
Iliofemoral ligament
Orbicular zone
Neck of femur
Intertro-chanteric crest
Sacrospinous ligament and ischial spine
Obturator internus tendon
Obturator internus bursa
Course of obturator externus
Synovial protrusion
Psoas major and lesser trochanter
(C) Posterior view

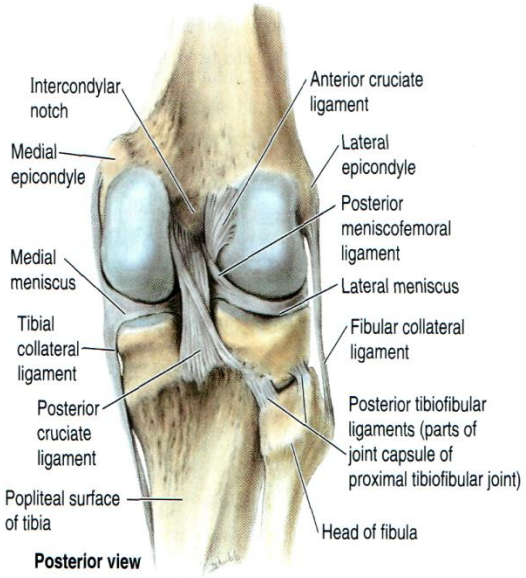
- **Knee Joint** (Articulatio genus, L.)
- **Articular surface of:** medial and lateral condyles of femur, medial and lateral condyles of tibia; patella.
- Knee-joint has lateral and medial meniscus.
- **Type:** Condyloid. Complicated. Complex.
- **Movements:** flexion and extension; slight rotation when leg is flexed.


Meniscus
(front view)
Lateral
meniscus
Medial
meniscus

- **Joints between bones of leg:**
- **Tibiofibular joint (proximal)** (Articulatio tibiofibularis, L.). Diarthrosis.
- **Articular surfaces of:** head of fibula and fibular facet below lateral condyle of tibia
- **Type:** Plane. Simple.
- **Movements:** limited gliding.



Superior view



Posterior view

- **Interosseous membrane.** Syndesmoses.
- Between interosseal margin of tibia and of fibula.
- Function: holds shaft together, strengthens fibula, for muscle attachments.
-

- **Ankle joint (talocrural)** (Articulatio talocruralis, L).
- **Articular surfaces of**: medial malleolus of tibia, lateral malleolus of fibula, and talus.
- **Type:** Ginglymus (hinge). Complicated.
- **Movements:** dorsoflexion (extension) and plantar flexion (flexion).

- **Subtalar (talocalcaneal) joint** (Articulatio talocalcanea, L).
- **Articular surfaces of:** talus and calcaneus.
- Type: Pivot.Simple. Combinated.
- Movements: limited rotation.

- **Talocalcaneonavicular joint**
- (Articulatio talocalcaneonaviculais, L).
- **Articular surfaces of**: talus, navicular, and calcaneus
- **Type:** Spheroidal. Complicated. Combinated with talocalcaneal.
- **Movements:** gliding and some rotation.

- **Calcaneocuboid joint** (Articulatio calcaneocuboideum, L)
- **Articular surfaces of:** cuboid and calcaneus.
- **Type:** Simplex. Combinated with talocalcaneal and talocalcaneonavicular joints.
- **Movements:** gliding and slight rotation.
-

- **Transversal tarsal joint** (Articulatio tarsi transversa, L)
- **Shopar′s joint** consist of: **calcaneocuboid and talonavicular joints.**
- **Articular surfaces of** this joints form S-shaped transversal line of foot.
- **Ligament** (key) of joint is bifurcated ligament: from the calcaneus to the cuboid and navicular.

- **Tarsometatarsal joints** (Articulatio tarsometatarsales, L), between the bases of the metatarsals, the three cuneiforms, and the cuboid. Are complicated with slight gliding movements.
- **Metatarsophalangeal joints** (Articulatio metatarsophalangeae, L) between the heads of the metatarsals and the bases of the proximal phalanges. Are simple, condyloid joints, permitting flexion, extension, abduction, and adduction.
-
- **Interphalangeal joints** (Articulatio interphalangea pedis, L) between bases and heads of adjoining phalanges. Are simple, ginglymus joints permitting flexion and extension.
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