

# **General arthrology**

**Joints of the spine, thorax,  
head and the hyoid bone**

# **SKELETAL JUNCTIONS** **(juncturae ossium)**

## **1. SYNARTHROSIS:**

- The bones are connected by a layer of connective tissue
- The articulare surface are missing, minimal movements
- Differentiation according the type of connective tissue

**a) ART. FIBROSA- SYNDESMOSIS**

**b) ART. CARTILAGINEA – SYNCHONDROSIS (SYMPHYSIS)**

**c) SYNOSTOSIS**

## **2. DIARTHROSIS: articulatio synovialis**

- Joint connection with contact

## **a) ART. FIBROSA- SYNDESMOSIS**

Connection using fibrous tissue

### **wedging (gomphosis):**

- it helps the tooth being inserted into dental alveolus of the jaw

### **suture (sutura):**

- connection of skull bones

smooth- plana

serrated- serrata

squamous- squamosa

### **ligament (ligamentum):**

- band of collagen fibrous tissue, (like a rope, ribbon or flat membrane)

## b) ART. CARTILAGINEA

### SYNCHONDROSIS

- Connection using hyaline cartilage  
(connection of ribs and sternum,  
between bones of the skull  
base- in child)

### SYMPHYSIS

- connection using fibrous cartilage  
(intervertebral discs, connection  
of the coxal bones with  
symphysis pubica)

## **c) SYNOSTOSIS**

- Connection of the bones using the bone tissue, the result is growing of two or more bones
- Exapmles: sacral bone, coccygeal bone, coxal bone, some skull bones
- In adulthood: synostosis of skull sutures - physiological, pathological

## 2. DIARTHROSIS

- Joint connection– **articulatio**, usually movable

### DESCRIPTION OF THE JOINT

- Contact articular surfaces - **facies articulares**
- Joint cavity - **cavitas articularis**
- Joint capsule - **capsula articularis**
- Special joint apparatus

**a) Articular surface (facies articularis):**

- surface, which is in connection with the other bone
- is covered by a layer of joint cartilage (hyaline)
- different shape, articular head (caput)- convex, articular fovea (fossa)- concave
- shape of the articular surfaces determines the possibility of movement in the joint

## **b) Articular capsule (capsula articularis):**

- **fibrous covering** of the joint
- **stratum fibrosum**- external layer from firm collagenous fibrous tissue, it has to protect the joint
- **stratum synoviale**- thin internal layer from fine fibrous tissue with vessels and nerves, it forms folds - **plicae synoviales**, and villi- **villi synoviales**, it produces a synovium- **synovia** (it has nutritive and mechanical functions)

## **c) Articular cavity (cavum articulare):**

- cavity (fissure) between articular surfaces and articular capsule, it is filled by synovia



## **d) Special joint apparatus:**

- Only in some joints
- They participate in ensuring of their better function

### **Joint ligaments (ligamenta articularia):**

- (intraarticular ligaments, extraarticular ligaments)

### **Cartilaginous plates (disci et menisci):**

- Fibrous cartilage, intraarticular, in joints with incongruent joint surfaces
- discus articularis- completely septates the joint cavity and divides it into two separated cavities
- meniscus articularis- it separates incompletely the joint cavity

### **Articular labra (labra articularia):**

- Bands of cartilaginous tissue, they enlarge and deepen the joint pits

### **Synovial bursae (bursae synoviales):**

- pouches around the joint, derivatives of the joint capsule, in the places, where tendons and muscle lie directly on the joint

# Ankylosis

# **Types of the joints**

# A. Classification of joints according to the shape of articular surfaces:

Tough joint with irregular surfaces- **AMPHIARTROSIS**

Flat joint - **ART. PLANA**

Spherical joint - **ART. SPHAEROIDEA**

- Free - **ARTHRODIA**

- Restricted - **ENARTHROSIS**

Cylindrical joint - **ART. CYLINDROIDEA**

- **GINGLYMUS**- the axe of movement is in the right angle to the longitudinal axe of bone

- Wheel joint - **TROCHOIDEA**- the axe of movement is parallel with the longitudinal axe of bone

Elipsoidal joint- **ART. ELLIPSOIDEA**

Sellar joint - **ART. SELLARIS**

Trochlear joint- **ART. TROCHLEARIS**

# AMPHIARTROSIS

ART. PLANA

**ART. SPHAEROIDAE**

**ARTHRODIA**

**ENARTHROSIS**

**ART. CYLINDROIDEA:**

**GINGLYMUS**

**TROCHOIDEA**

**ART. ELLIPSOIDEA**

**ART. SELLARIS**

**ART. TROCHLEARIS**

## **B. Classification of joints according to the level of moveability and number of axis of movements.:**

### **Joints with minimal movement:**

- With irregular surfaces - **amphiartrosis**

### **Joints with sliding movements:**

- Flat joints - **articulatio plana**

### **Joints with rotational movements:**

- Joint surfaces allow rotation along one to three axis
- **One-axis joints (art. cylindroidea and art. trochlearis)**
- **Two-axis joints (art. ellipsoidea and art. sellaris)**
- **Triaxial joints (art. sphaeroidea)**



## **C. Classification of joints according to the number of connecting bones:**

**Simple joint - art. simplex-** two bones are connecting

**Composed joint - art. composita-** two or more bone are connecting, or two bones with discus or meniscus

# **Junctions of the spine** **and thorax**

# Junctions of the spine

## Spine (columna vertebralis)

We can observe all types of junctiones on the spine

**Synartroses and diarthroses** as well

### Synarthrosis

- syndesmosis- ligaments
- synchondrosis- **disci intervertebrales**
  - synchondrosis **sacrococcygea**
- synostosis- **os sacrum, os coccygis**

Diarthrosis- **articulationes intervertebrales**

# **Spojení mezi obratli**

## **1. Junctiones of vertebral bodies**

**– disci intervertebrales: altogether 23, cartilaginous (symphysis) connection (anulus fibrosus – hyaline and fibrous cartilae, nucleus pulposus – fibrous tissue)**

# **Articulatio uncovertebralis**

## **2. Junctions of vertebral arches**

- elastic liaments– ligamenta flava (interarcualia)**

### **3. Junctions of articular processes of vertebrae**

- **articulationes intervertebrales**

sliding movements

- short ligaments - **ligg. intertransversaria**

- **ligg. interspinalia**

- **lig. supraspinale** (cervical area) –

as sagittally oriented **ligamentum nuchae** which is going to the occipital bone

#### **4. Junctions common for all vertebrae**

**a) lig. longitudinale anterius**

**b) lig. longitudinale posterius**

- They continue also to the sacral and coccygeal bone



# **Synostosis**

- Connection using the bone tissue
- Sacral bone: fusion of five sacral vertebrae
- Coccygeal bone: fusion of 3 - 5 coccygeal vertebrae

# Curvature of vertebral column

## 1. In the sagittal plane

- double S-shaped:

**lordosis**: curvature forwards, cervical C4-5 and lumbar L3-4

**kyphosis**: curvature backwards, thoracic Th6-7 and sacral

## **2. Curvature in frontal plane**

- Skoliosis, mild skoliosis is physiological and it is present in all people – in most mild right, in some mild left (if you are right or left-handed)

# SHAPE AND MOVEMENTS OF THE SPINE

- 35% of body height

## Movements

- **anteflexion, retroflexion**, 90° cervical, 23° lumbar, most stressed and vulnerable is part of the lower cervical vertebrae, Th11-12, L4-S1
- **lateroflexion**, 30° cervical, 35° lumbar
- Rotation and torzion, 60-70° cervical, 25-35° thoracic
- Springing movements

## Mobility of the vertebral column

- depends on the size of intervertebral disc
- te mobility is rectricted by: ligaments, articular capsules and muscles

# Junctiones of thoracic cage

## **1. Art. costovertebrales**

- a) art. capitis costae
- b) art. costotransversarium

## **2. Juncturae sternocostales**

- a) artt. sternocostales (2nd-5th)
- b) synchondrosis (1st, 6th, 7th)

## **3. Juncturae intercostales**

- a) artt. interchondrales (6th-9th)
- b) membrana intercostalis externa,  
interna

# A. Articulationes costovertebrales

## 1. Articulationes capitis costae

**Articular surfaces:** facies articularis capitis costae and foveae costales on thoracic vertebrae

**articular capsule:** firm and it is attached to the margins of articular surfaces

**special apparatus:** lig. capitis costae radiatum, at 2nd – 10th rib: lig. capitis costae intraarticulare

**movements:** along axis parallel with the neck of the rib

## **2. Articulationes costotransversariae**

**articular surfaces:** foveae costales transversales  
and art. surface on tuberculum costae

**articular capsule:** margins of the articular surfaces

**special apparatus:** lig. costotransversaria, between  
collum costae and transversal process of the vertebra

**Movements:** along axis which is parallel with collum  
costae

## **B. Juncturae sternocostales**

- Connections between costal cartilages and sternum

**1. Synchondrosis sternocostalis:** cartilaginous connection with incisura costalis sterni, regularly at 1st often at 6th and 7th rib

**2. Artt. sternocostales:**

between 2nd to 5th rib and sternum

**Articular surfaces:** sternal end of costal cartilage, incisura costalis sterni

**Articular capsule:** to the margins of the articular surfaces

**Special apparatus:** ligg. sternocostalia radiata – they form membrana sterni externa and interna



## **C. Junctions of adjacent ribs**

### **1. Articulationes interchondrales**

joint connection between costal cartilages of 5th to 9th rib, covered by short articular capsule

### **2. Membranae intercostales – fibrous membranes connecting adjacent ribs**

**Membrana intercostalis externa**

**Membrana intercostalis interna**

## Cest cage shape and movements

- **Shape of truncated cone**
- **base (apertura thoracis inferior)**
- **apex (apertura thoracis superior)**
- **walls – frontal, dorsal, lateral**

**cavitas thoracis**

**spatia intercostalia**

**arcus costarum**

**angulus infrasternalis**

## Movements

- in costovertebral connections, axis runs parallel with collum costae
- Upward rotation - inspirium  
downward rotation- exspirium

## Junctions of skull

Craniovertebral junctions, syndesmoses, synchondroses, temporomandibular joint and hyoid junctions

### I. Craniovertebral junctions

- Connection of the skull with the 1st and 2nd cervical vertebra

#### 1. *Articulatio atlantooccipitalis*

- Paired joint

#### Articular surfaces:

*condyli occipitales* and  
*foveae articulares superiores*  
of atlas

#### Articular capsule:

Is attached to the margins of  
the articular surfaces

**Special apparatus:**

***membrana atlantooccipitalis anterior and posterior***

(between arches of atlas and occipital bone)

***membrana tectoria***

(cranial continuation of ***lig. longitudinale posterius***, it reaches to *clivus*)

**Type of joint: elipsoidal** with possibility of flexion and extension of the head and there are also possible smaller movements sideways

## 2. Articulatio atlantoaxialis

### a) articulatio atlantoaxialis lateralis

• Paired joint

#### Articular surfaces:

**facies articulares inferiores** of atlas

**facies articulares superiores** of axis

### b) articulatio atlantoaxialis mediana

• Unpaired joint

#### Articular surfaces:

**facies articularis anterior** on frontal side of *dens axis* with **fovea dentis** of atlas

**a facies articularis posterior** on dorsal side of *dens axis* with **lig. transversum atlantis**

Articular capsule: is common and is attached to the margins of the articular surfaces

**Special apparatus:**

***lig. apicis dentis, ligg. alaria, lig. cruciforme atlantis***, formed by ***lig. transversum atlantis*** and vertical fibrous bands going from axis to occipital bone (***fasciculi longitudinales***)

**Type of joint:** both joints form one mechanical unit, atlas is rotating along *dens axis* in range of 60°

## **II. Skull syndesmoses**

Present sutures (**suturae**), between the margins of the bones, there is a layer of fibrous tissue

## **III. Skull synchondroses**

**s. sphenopetrosa+s. petrooccipitalis**

**s.interoccipitalis- anterior et posterior**

**s.intersphenoidalis, s.sphenooccipitalis**

**synchondrosis sphenooccipitalis**

## IV. Temporomandibular joint (*articulatio temporomandibularis*)

**Articular surfaces:** *caput mandibulae* connects with *fossa mandibularis* and *tuberculum articulare* of temporal bone

**Articular capsule:** is attached to the margins of the articular surfaces, its medial part is very strong, it rows together with *discus articularis*

**Type of joint:** **gynghimus**

Elevation – closing of the mouth

Depresion – opening of the mouth

protraction - shifting of the chin forwards

Retraction - shifting of the chin backwards



## **Special apparatus:**

**discus articularis** (fibrous cartilage) – its middle part is thinner and the margins are thicker, it grows together with articular capsule, it divides articular cavity into ***pars discotemporalis*** and ***discomandibularis***.

**Articular capsule:** on lateral side: ***lig. laterale***, around the joint: ***lig. sphenomandibulare*** and ***lig. stylomandibulare***

## V. Hyoid junctions

The skull and hyoid bone connects using muscle and *lig. stylohyoideum*

X-ray picture of  
skull of Maxmilián  
the 2nd with good  
visible processus  
styloideus  
elongatus, 7 cm  
long

# Thank you for your attention!!

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