

# OSNOVE FUNKCIONALNE ANATOMIJE II

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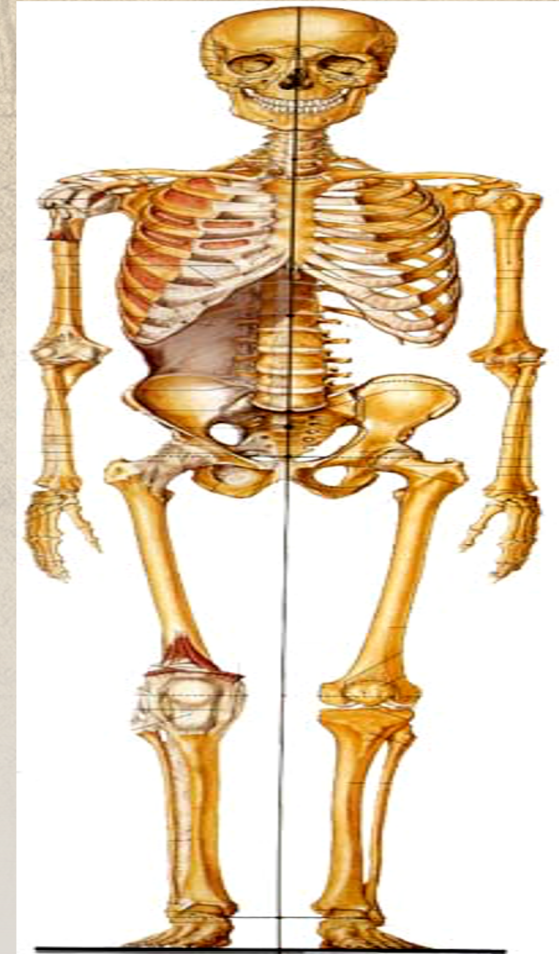
<PROF. DR VLADIMIR ANTIĆ>



# KOŠTANI SISTEM (OPŠTA OSTEOLOGIJA)



- **Ukupno 206 kostiju**
- **Osovinski skelet** (*skeleton axiale*) - 80 kostiju
  - lobanja (*cranium*)
  - kičmeni stub (*columna vertebralis*)
  - grudna kost (*sternum*)
  - rebra (*costae*)
- **Pridruženi skelet** (*skeleton apendiculare*) - 126 kostiju
  - kosti gornjeg uda (*ossa membri superioris*)
  - kosti donjeg uda (*ossa membri inferioris*)





# KOŠTANI SISTEM - FUNKCIJA

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- **Potporna**
- **Zaštitna uloga**
- **Hematopetska funkcija**
- **Depoi minerala**



# DEFINICIJA PODELA KOSTIJU PREMA OBLIKU

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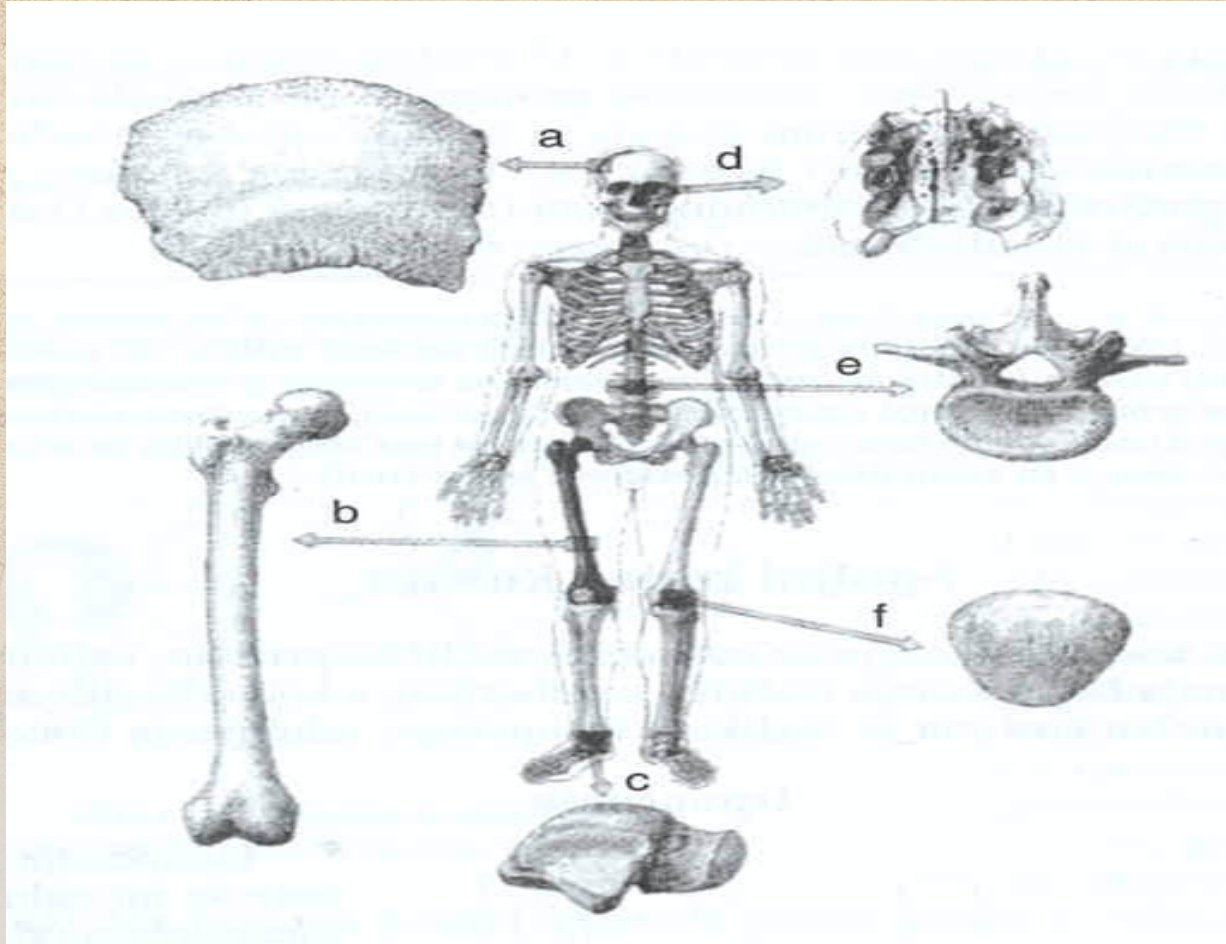


- **Duge kosti** (*ossa longa*)
- **Kratke kosti** (*ossa brevia*)
- **Pljosnate kosti** (*ossa plana*)
- **Nepravilne kosti** (*ossa irregularia*)
- **Pneumatične kosti** (*ossa pneumatica*)
- **Sezamoidne kosti** (*ossa sesamoidea*)



# DEFINICIJA PODELA KOSTIJU PREMA OBLIKU

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# GRAĐA KOSTIJU



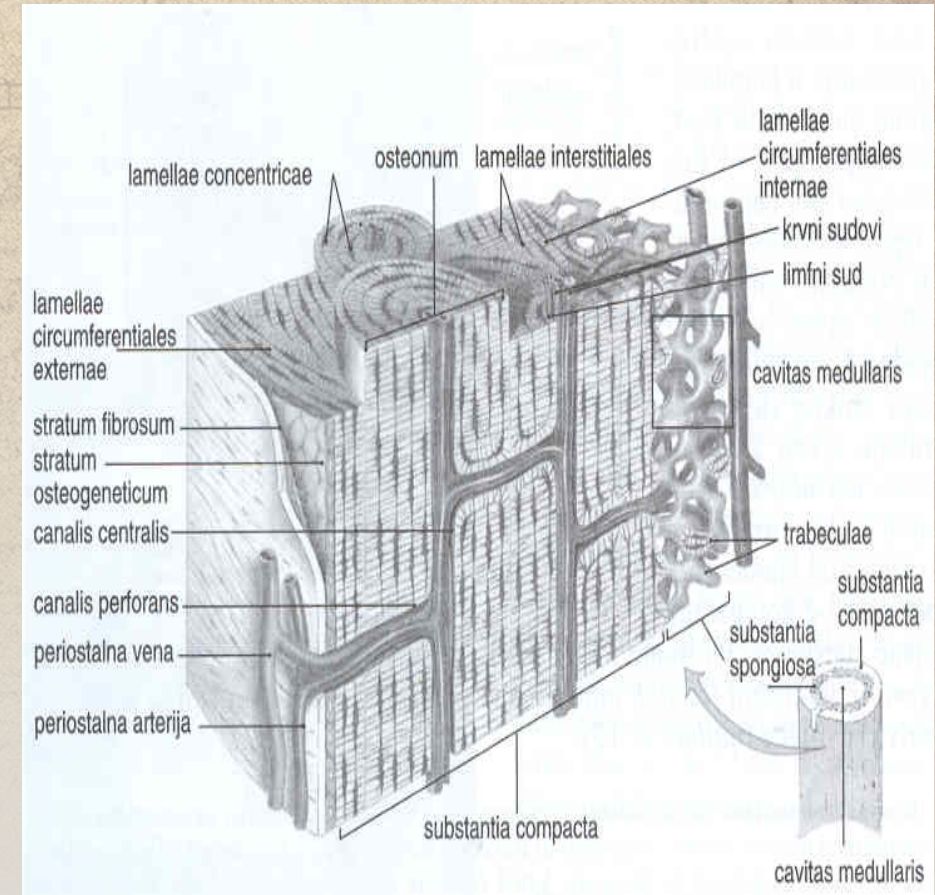
## Koštano tkivo

- kompaktno
- sunderasto

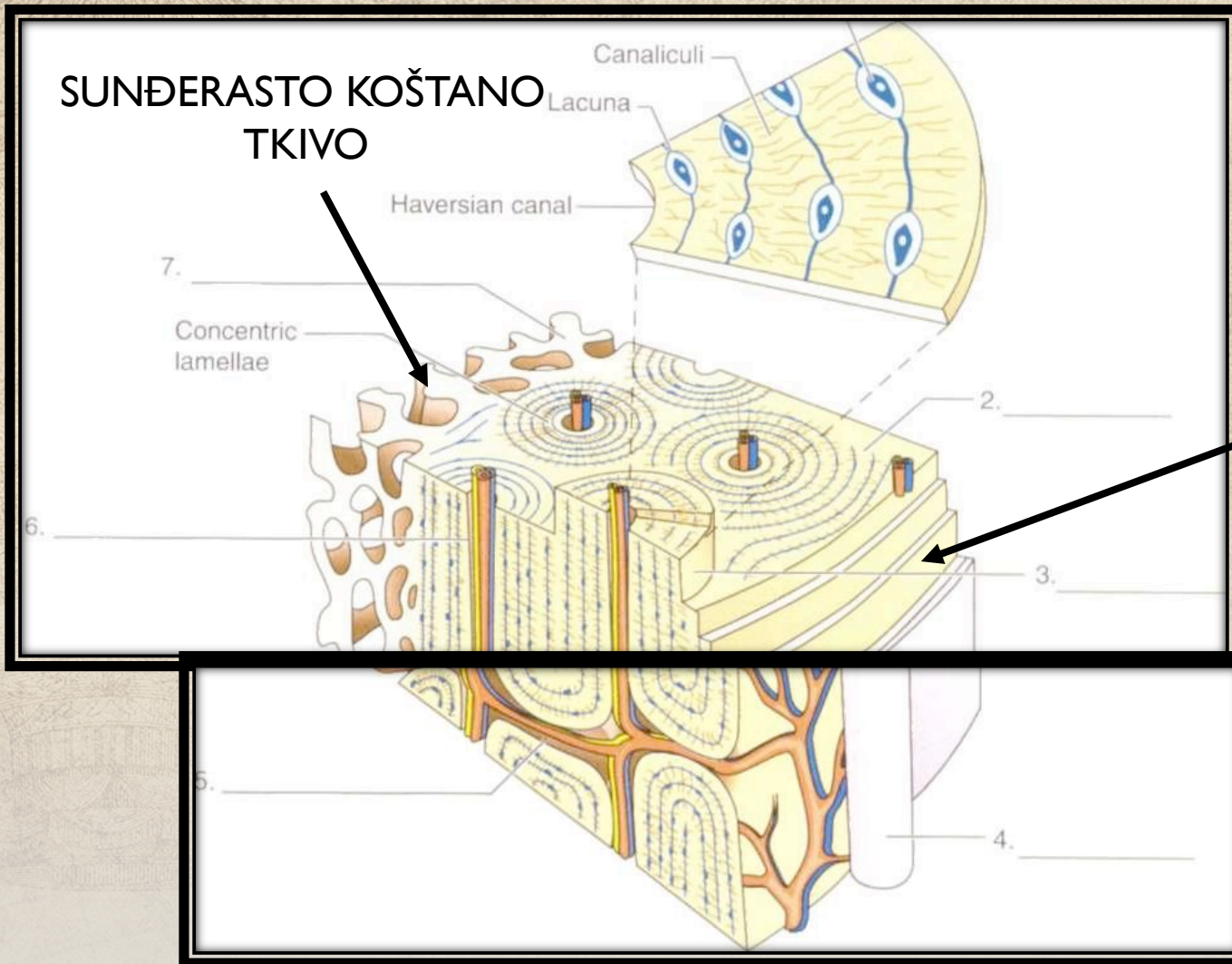
Hversovi i Volkmanovi kanali

Koštana srž – medularni kanal

Pokosnica – površina kosti







## Kompozicija kostiju

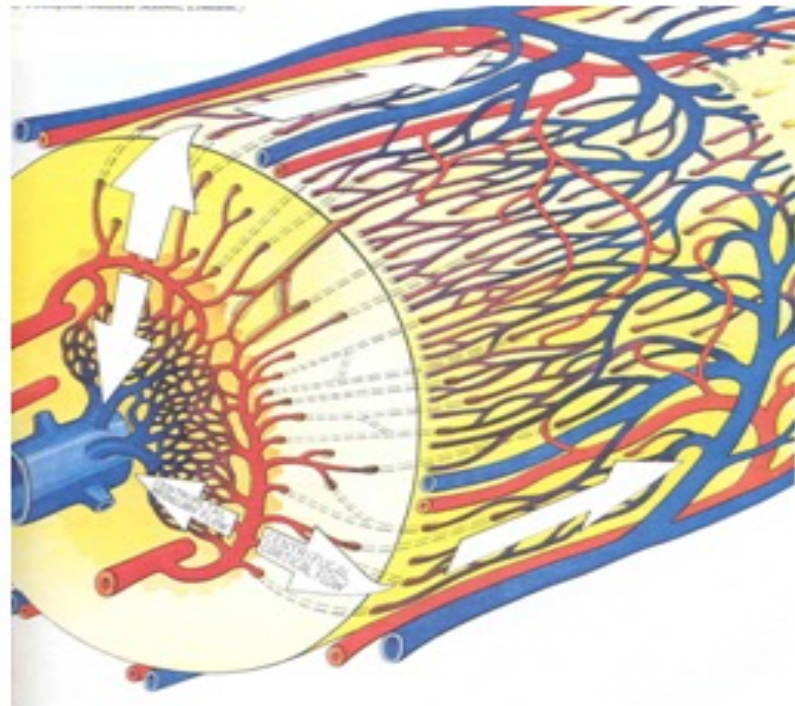
KOMPAKTNO KOŠTANO  
TKIVO



# VASKULARIZACIJA KOSTIJU

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## OPŠTA OSTEOLOGIJA - vaskularizacija





# OSObine KOŠTANOG TKIVA

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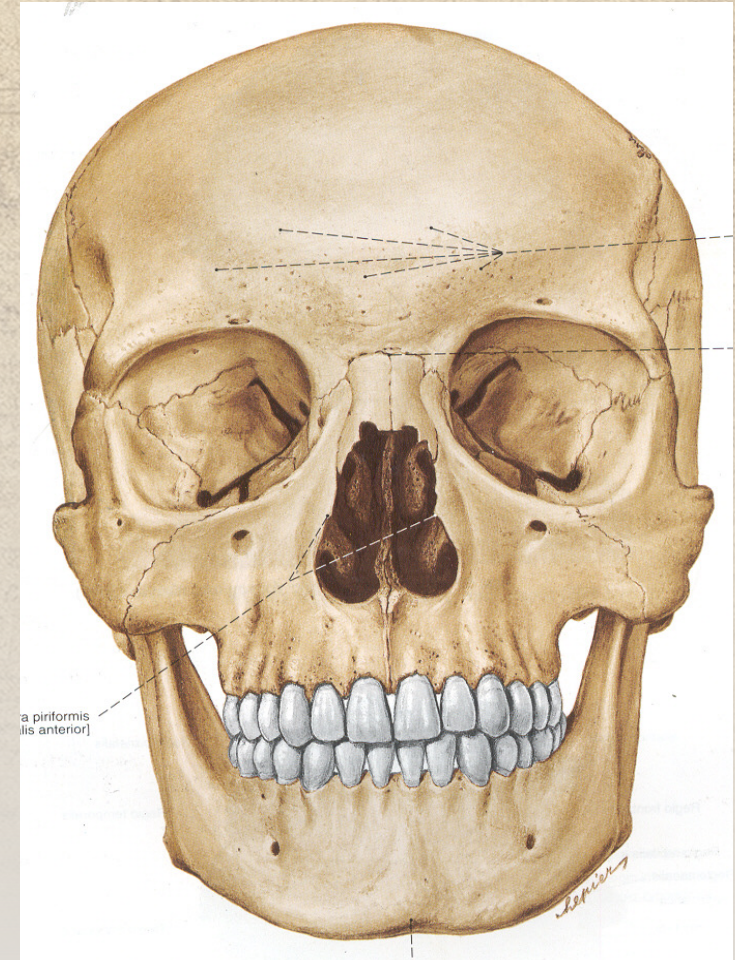
- **ATROFIJA**
- **HIPERTROFIJA**
- **REGENERACIJA**



# KOŠTANI SISTEMI GLAVE I VRATA



- LOBANJA (CRANIUM):
  - NEUROCRANIUM (kosti glave)
  - VISCEROCRANIUM (kosti lica)





# KOŠTANI SISTEM GLAVE I VRATA

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## NEUROCRANIUM

### PARNE

OS TEMPORALE

OS PARIETALE

### NEPARNE

OS FRONTALE

OS SPHENOIDALE

OS OCCIPITALE



# KOŠTANI SISTEM GLAVE I VRATA

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## VISCEROCRANIUM

### PARNE

maxilla

os zygomaticum

os palatinum

os nasale

os lacrimale

concha nasalis inferior

### NEPARNE

mandibula

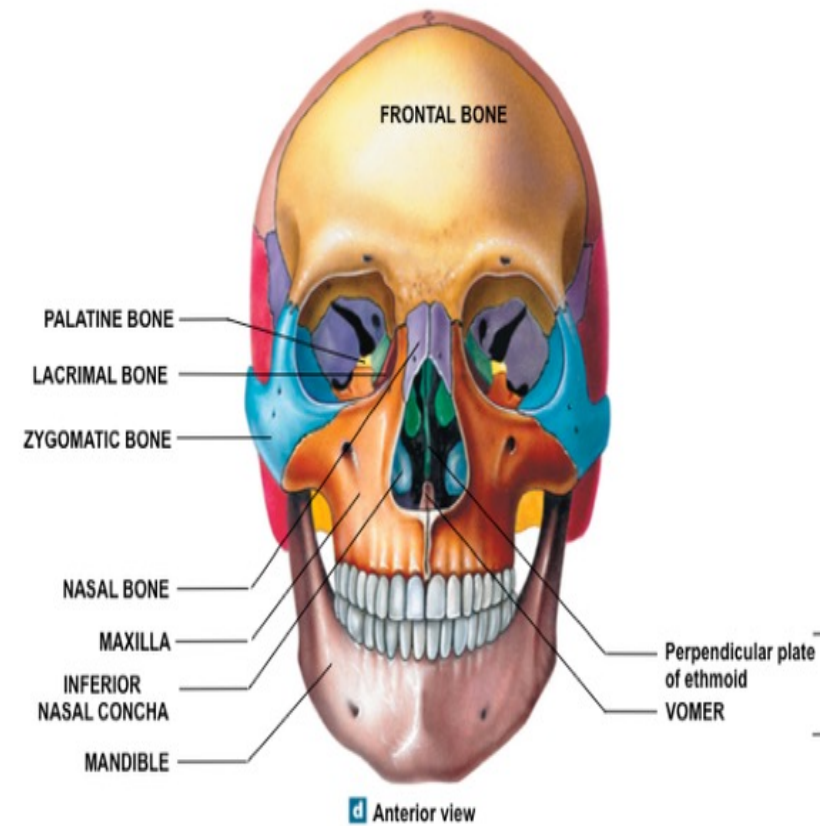
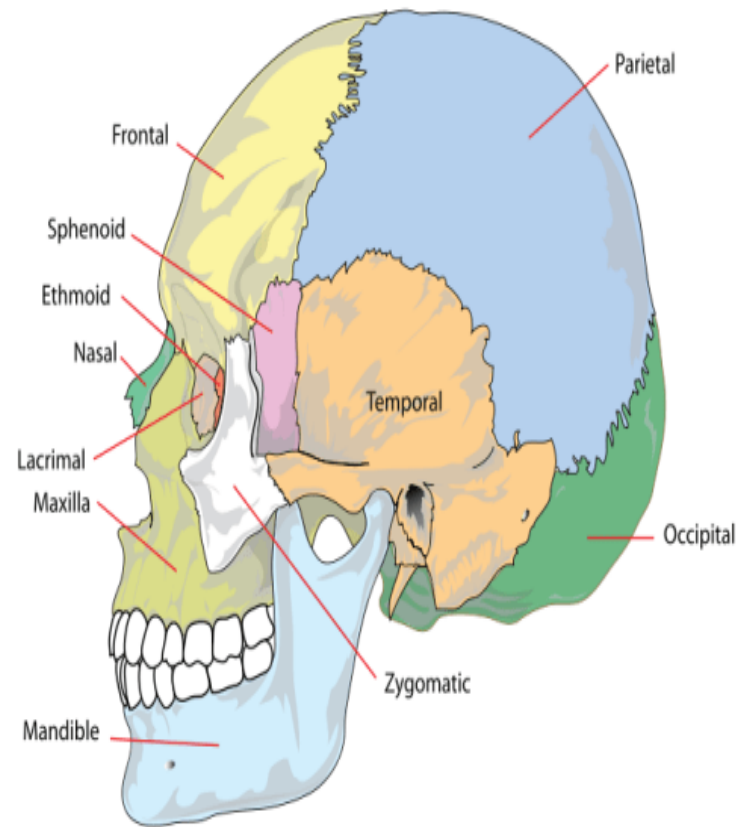
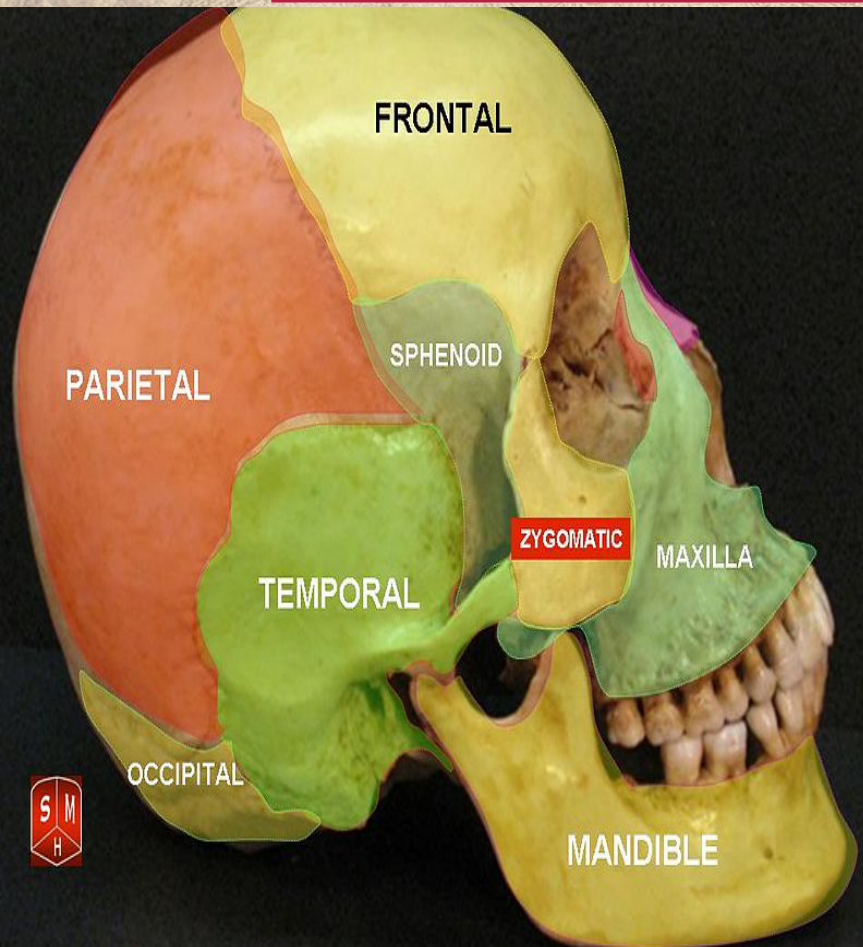
vomer

os hyoideum (vrat)

os ethmoidale



# KOSTI GLAVE I VRATA





# KOŠTANI SISTEM GRUDNOG KOŠA

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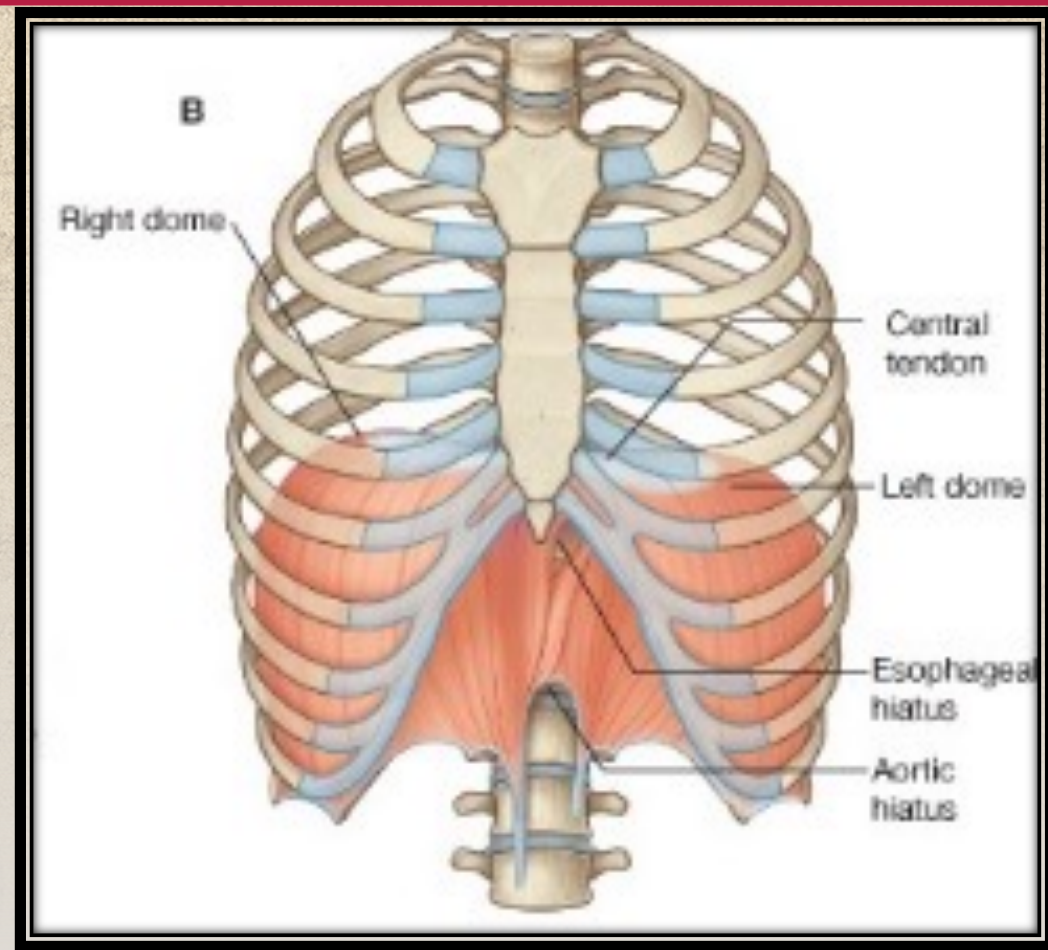
## ZIDOVI GRUDNOG KOŠA

1. kosti
2. zglobovi
3. mišići
4. krvni i limfni sudovi
5. živci



# KOŠTANI SISTEM GRUDNOG KOŠA

- Deo trupa između vrata gore i trbuha dole.
- Oblika zarubljene kupe, sa širom bazom okrenutom naniže, a užom bazom okrenutom naviše
- Opisuju mu se:
  - Gornji otvor
  - Donji otvor
  - Zidovi (prednji, zadnji i dva bočna)
  - Grudna duplja
- Zidovi grudnog koša su građeni iz kože, potkožnog tkiva, fascija, mišića, krvnih sudova, limfnih sudova, živaca, kostiju i zglobova





# KOŠTANI SISTEM GRUDNOG KOŠA

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- Sternum (grudna kost)
- Costae (rebra)
- Columna vertebrales (kičmeni stub)

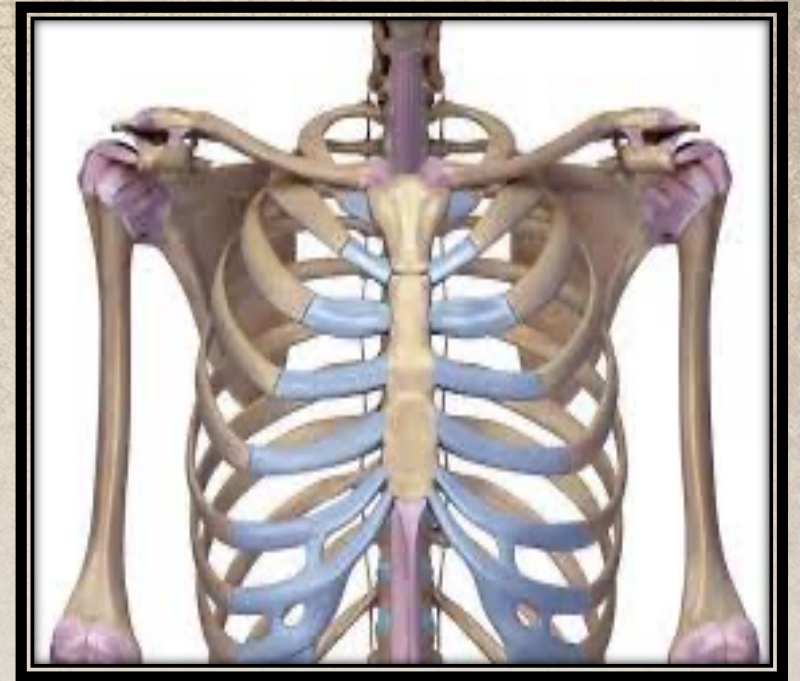


# STERNUM (GRUDNA KOST)

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\*Osnovni delovi\*

1. Drška grudne kosti (***manubrium sterni***)
2. Telo grudne kosti (***corpus sterni***)
3. Ksifoidni nastavak (***processus xiphoideus***)





# STERNUM (MANUBRIUM STERNI)

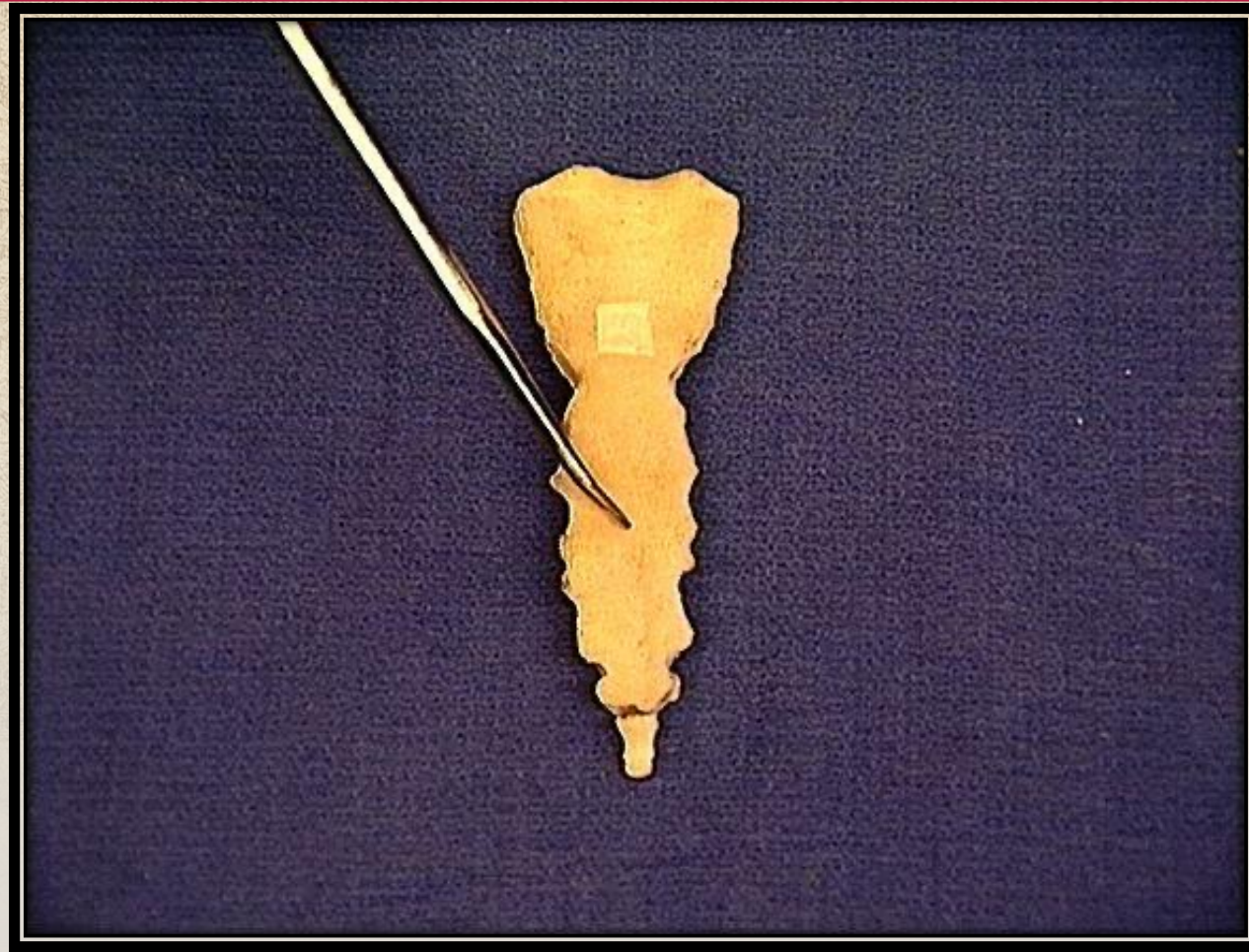
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# STERNUM (CORPUS STERNI)

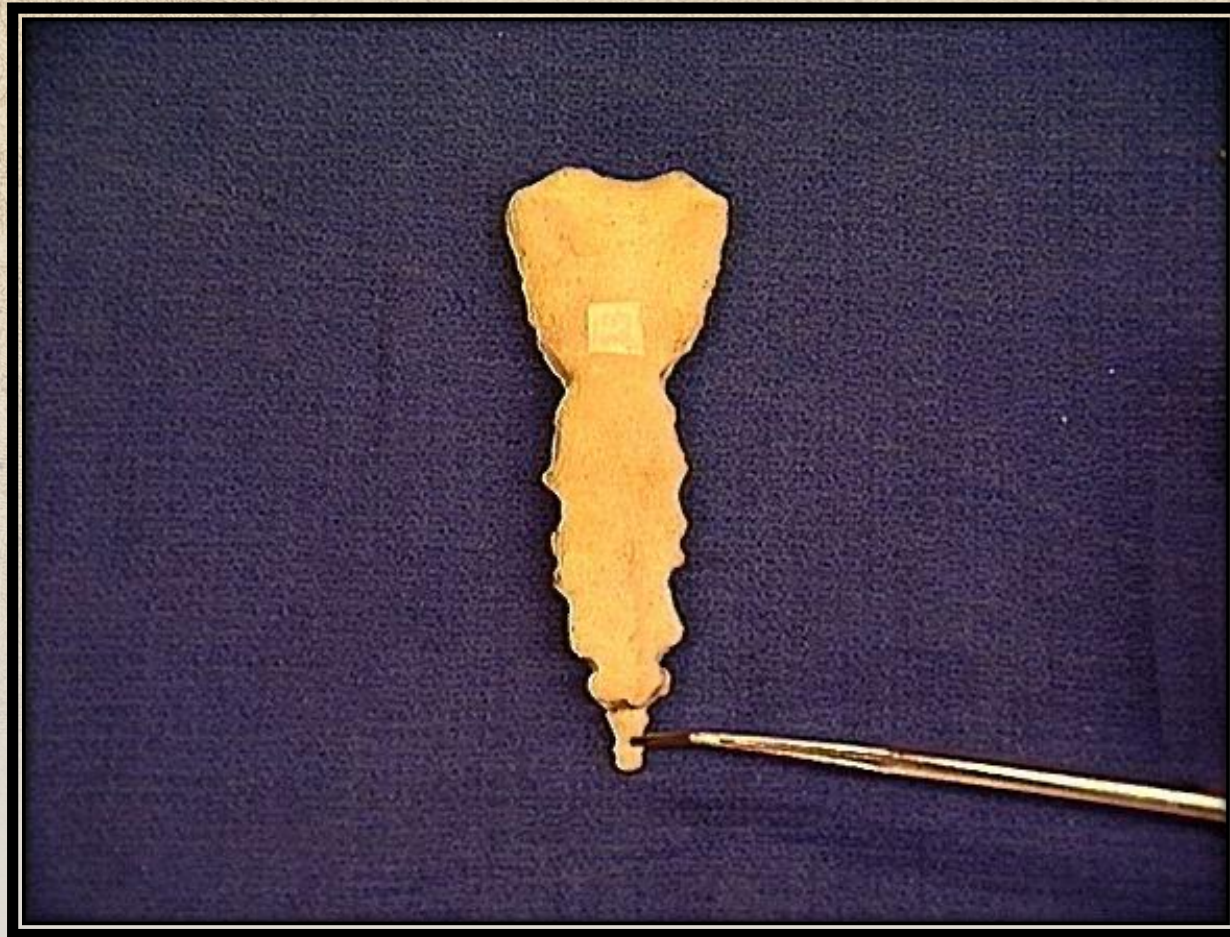
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# STERNUM (PROCESSUS XIPHOIDEUS)

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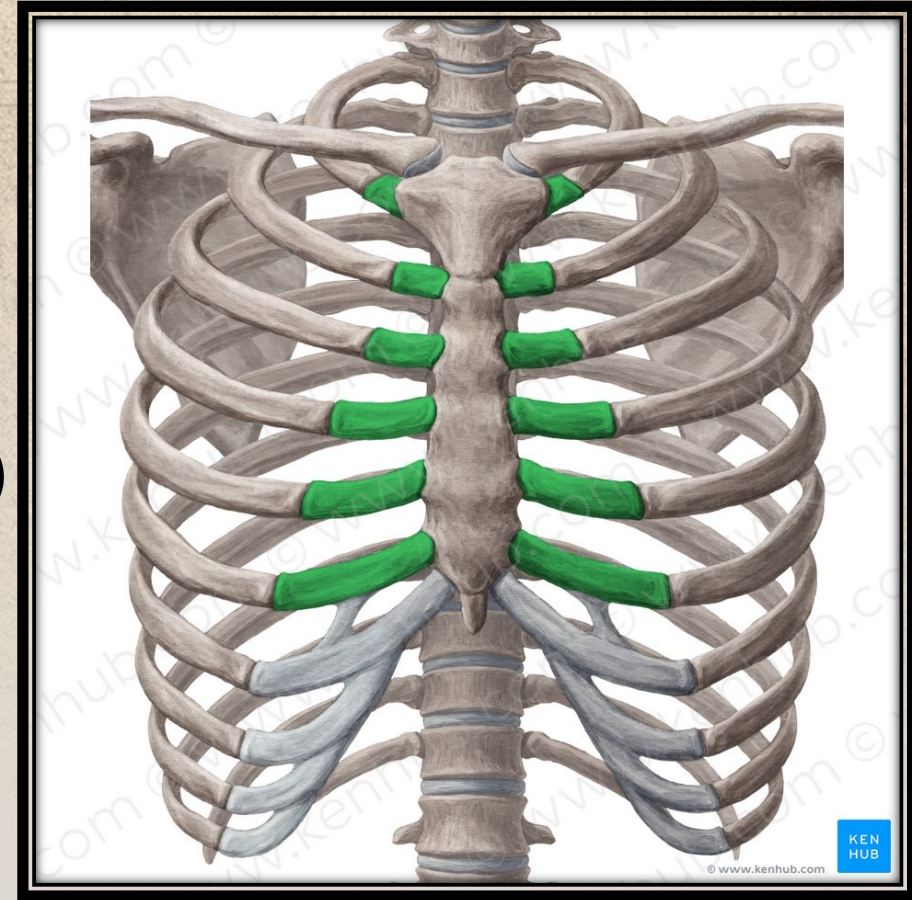
# KOŠTANI SISTEM (REBRA)

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**1-7 = Costae verae (prava)**

**8-10 = Costae spuriae (lažna)**

**11-12 = Costae fluctuantes (slobodna)**





# TIPIČNO REBRO

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## 1. TELO (CORPUS COSTAE)

Gornja i donja ivica

Spoljna i unutrašnja strana

## 2. PREDNJI KRAJ

## 3. ZADNJI KRAJ

Caput costae

Collum costae

Tuberculum costae

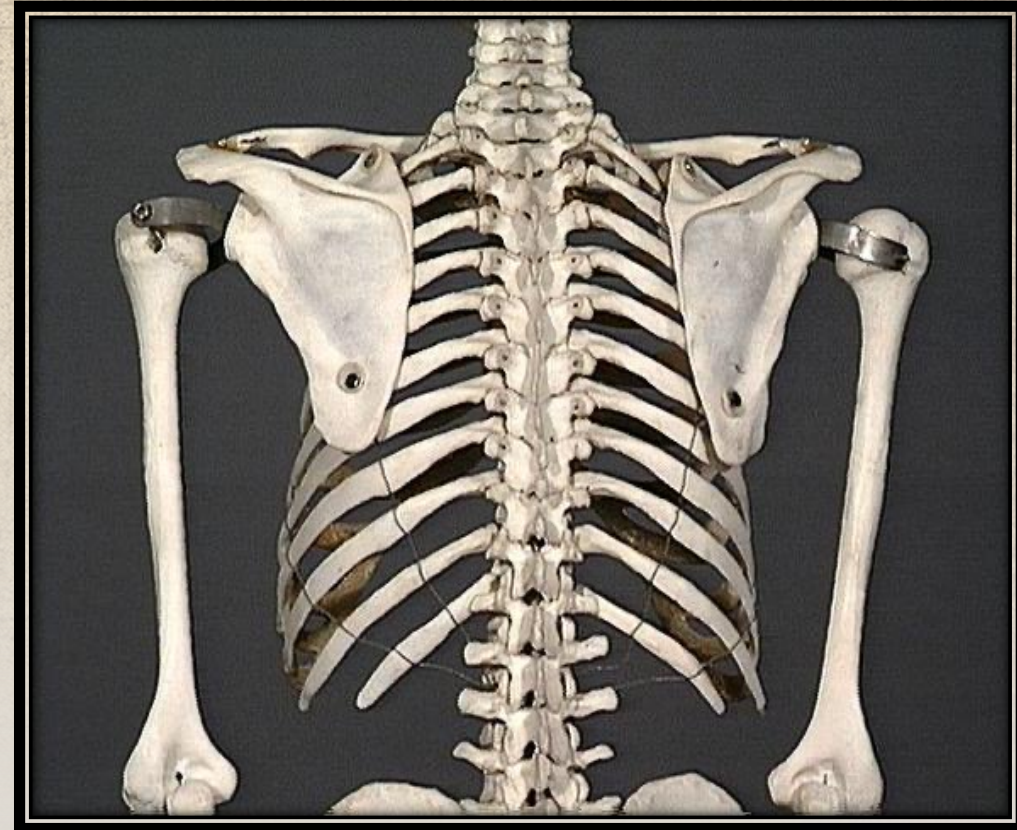
## 4. REBARNI UGAO (ANGULUS COSTAE)



# **COSTAE (ATYPICAE\*)**

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1. COSTA PRIMA (I)
2. COSTA SECUNDA (II)
3. COSTA UNDECIMA (XI)
4. COSTA DUODECIMA (XII)





# KOŠTANI SISTEM KIČMENOOG STUBA

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- Kičmeni stub se sastoji od svih kičmenih pršljenova (vertebrae)
- Ukupno 33/34
  - 7 vratnih
  - 12 grudnih
  - 5 lumbalnih
  - 5 sakralnih
  - 4/5 trtičnih



## Osnovni delovi:

1. Corpus vertebrae

2. Arcus vertebrae

Pediculus arcus vertebrae

Lamina arcus vertebrae

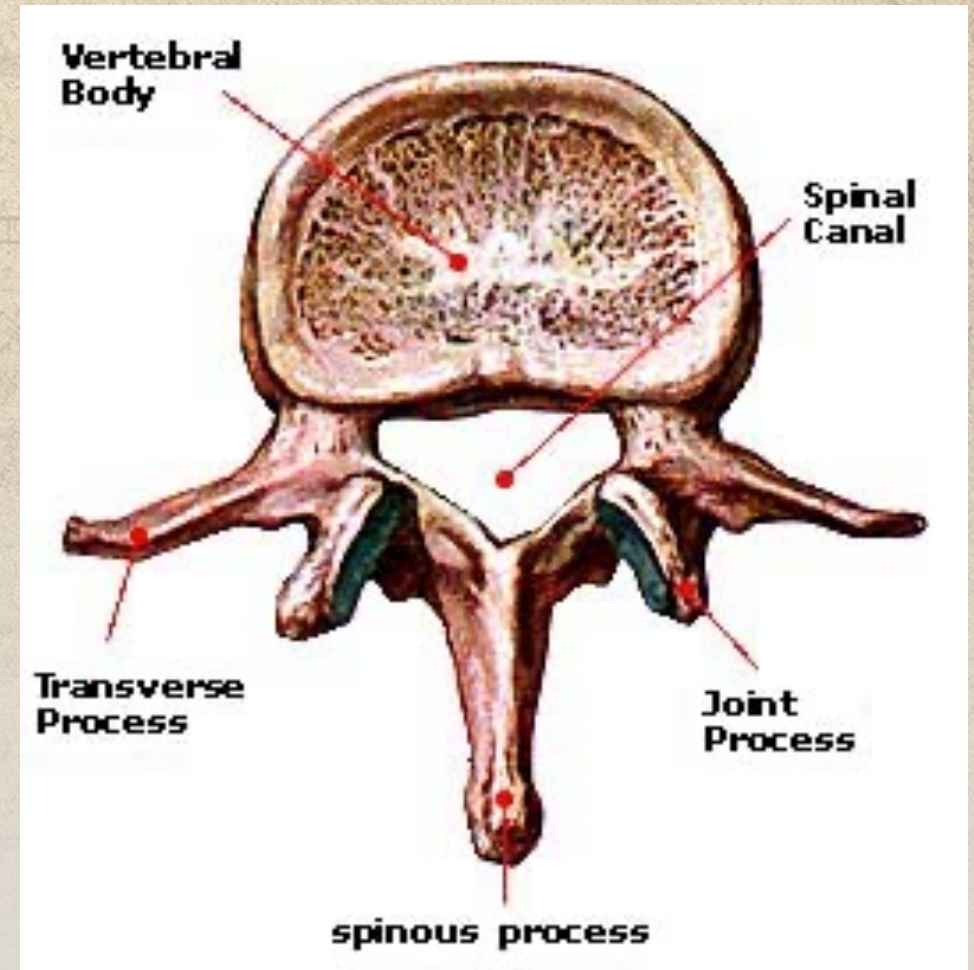
3. Foramen vertebrale

4. Processus transversus

6. Processus articularis inferior

7. Processus spinosus

## VERTEBRAE





# VERTEBRAE

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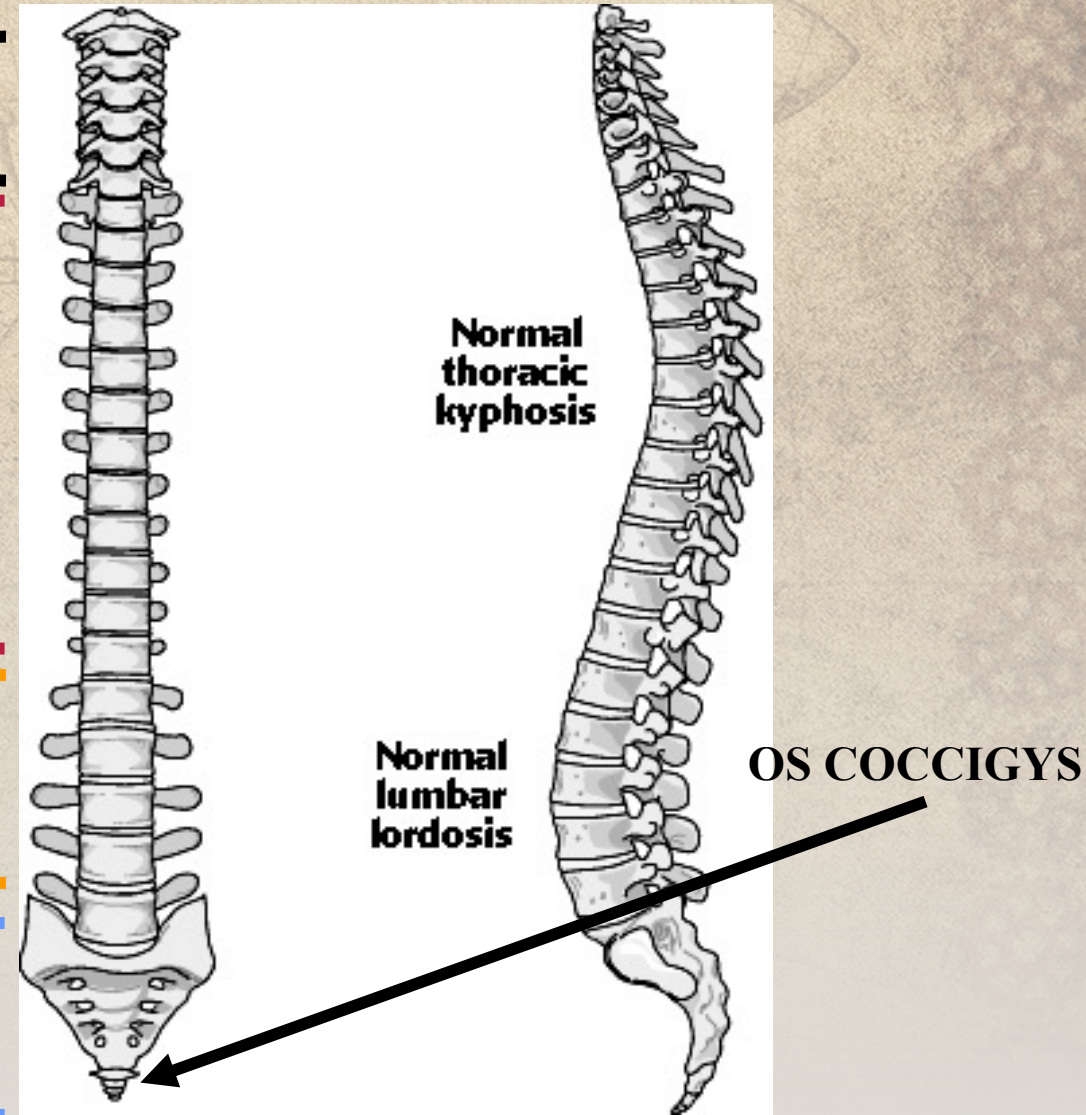
# COLUMNA VERTEBRALIS

VERTEBRAE CERVICALES (C1-CVII)

VERTEBRAE THORACICAE (T1-TXII)

VERTEBRAE LUMBALES (L1-LV)

OS SACRUM (VERTEBRAE SACRALES I-V)





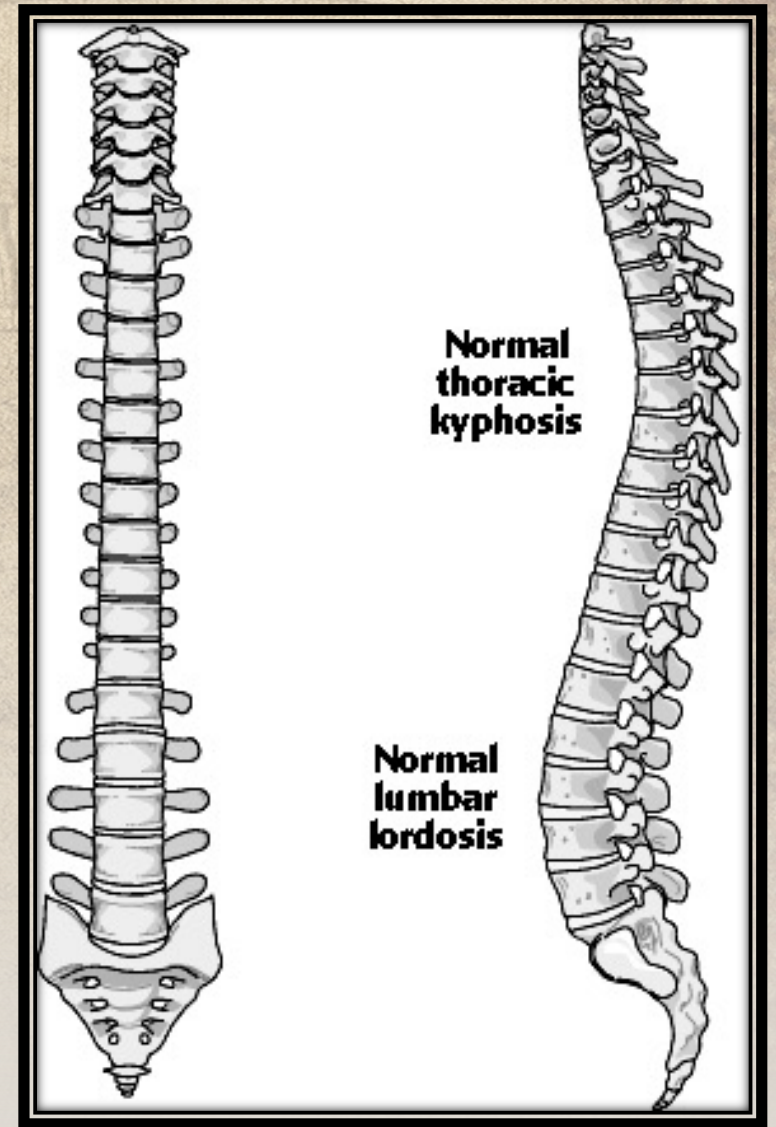
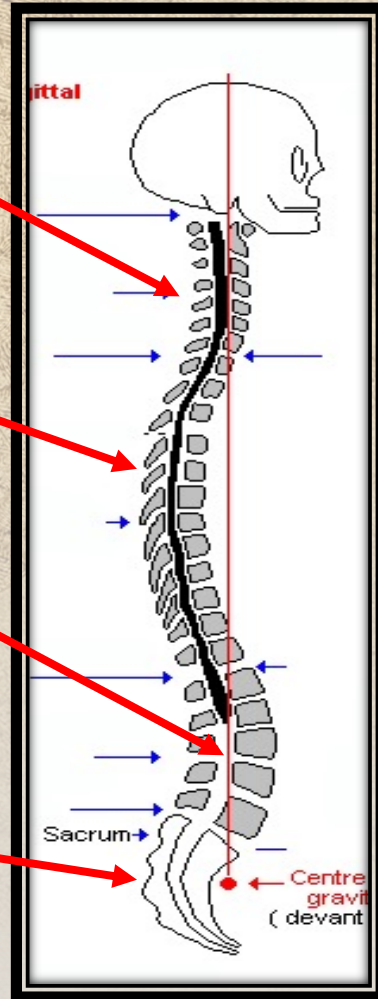
# COLUMNA VERTEBRALIS

vratna lordoza

grudna kifoza

slabinska lordoza

krsna kifoza





# COLUMNA VERTREBRALIS

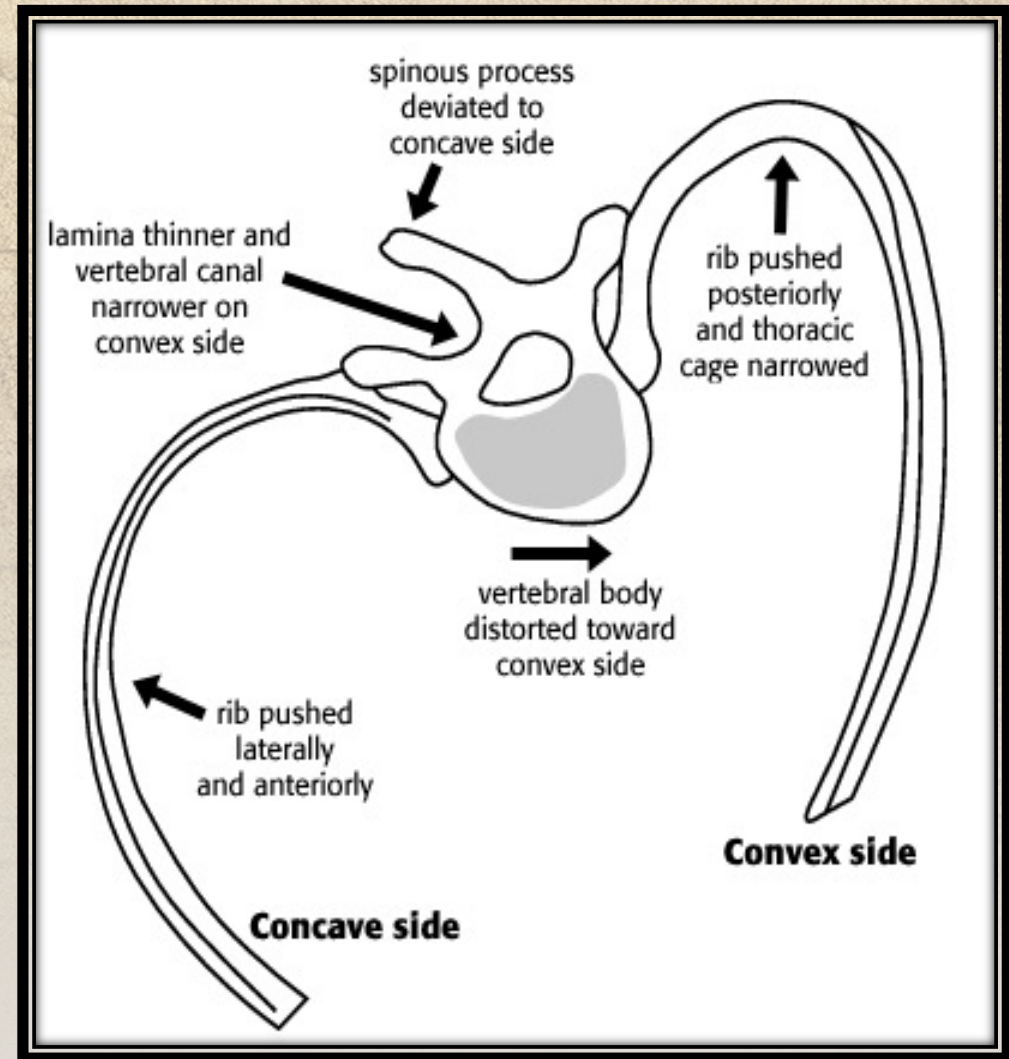
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# SCOLIOSIS (ISKRIVLJENOST KIČME)

- Morfološku sliku kičmenog stuba grudnog koša u skoliozi karakteriše tipična distorzija pršljena i rebara





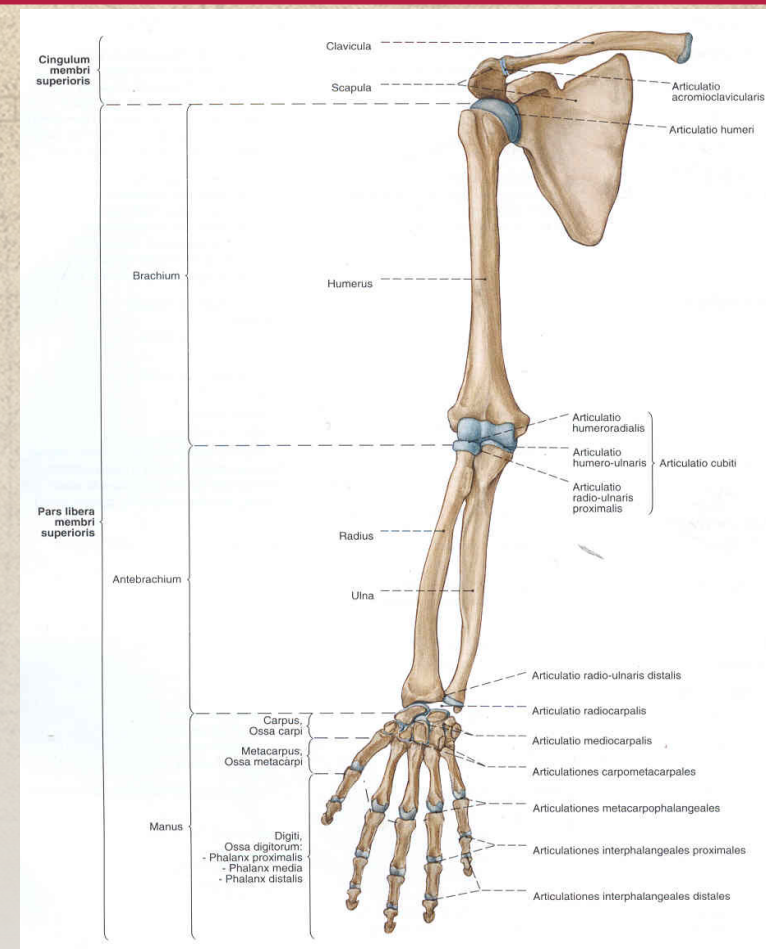
# KOŠTANI SISTEM GORNJEG EKSTREMITETA

## Kosti ramenog pojasa:

- **Ključna kost (*clavicula*)**
- **Lopatica (*scapula*)**

## Kosti slobodnog dela:

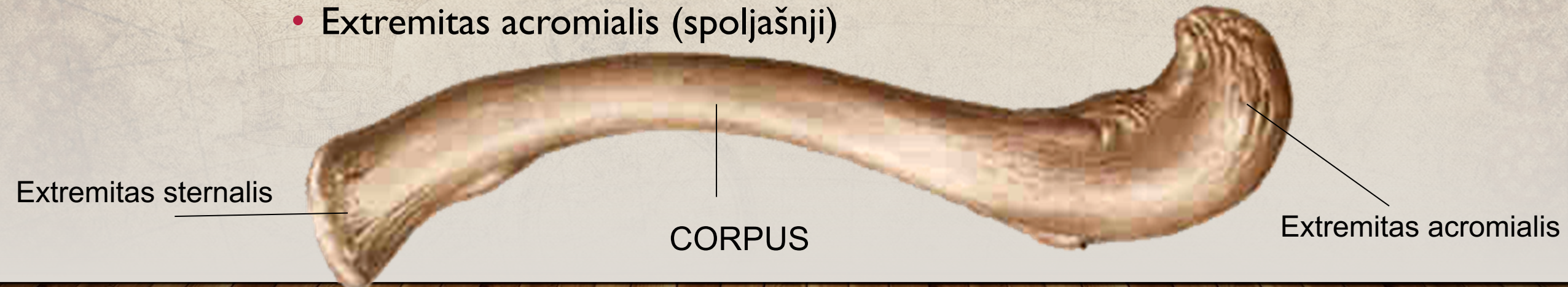
- **Ramena kost (*humerus*)**
- Lakatna kost (*ulna*)
- Žbica (*radius*)
- Kosti šake (*ossa manus*)





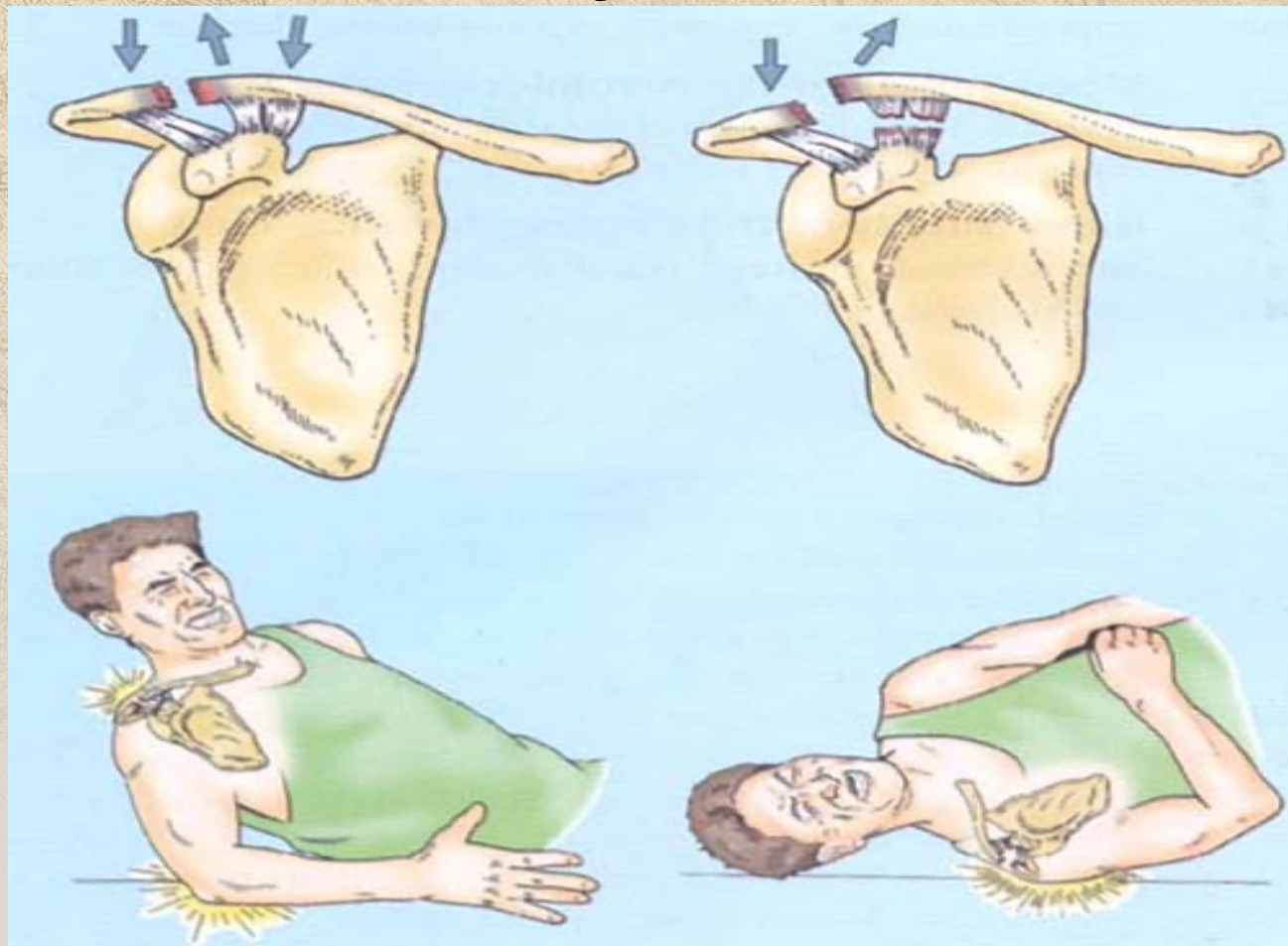
# KLJUČNA KOST (*CLAVICULA*)

- Delovi:
  - Telo (corpus)
  - Okrajci:
    - Extremitas sternalis (unutrašnji)
    - Extremitas acromialis (spoljašnji)





# PRELOM KLJUČNE KOSTI





# LOPATICA – SCAPULA (ZADNJA STRANA)

## STRANE:

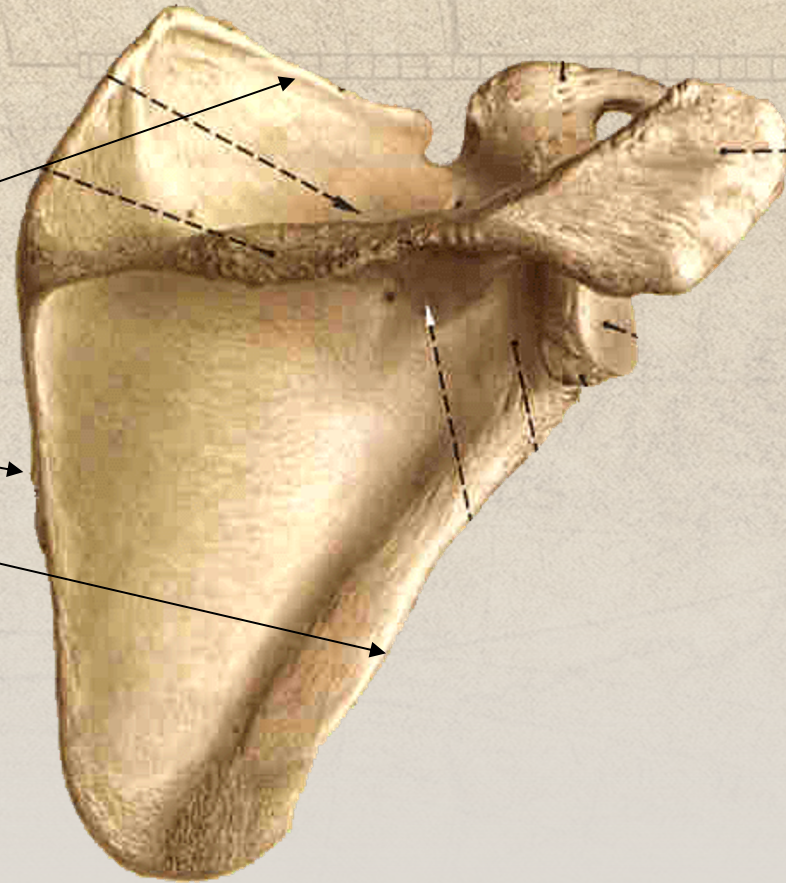
Facies posterior  
Facies costalis

## IVICE:

Margo superior  
Margo medialis  
Margo lateralis

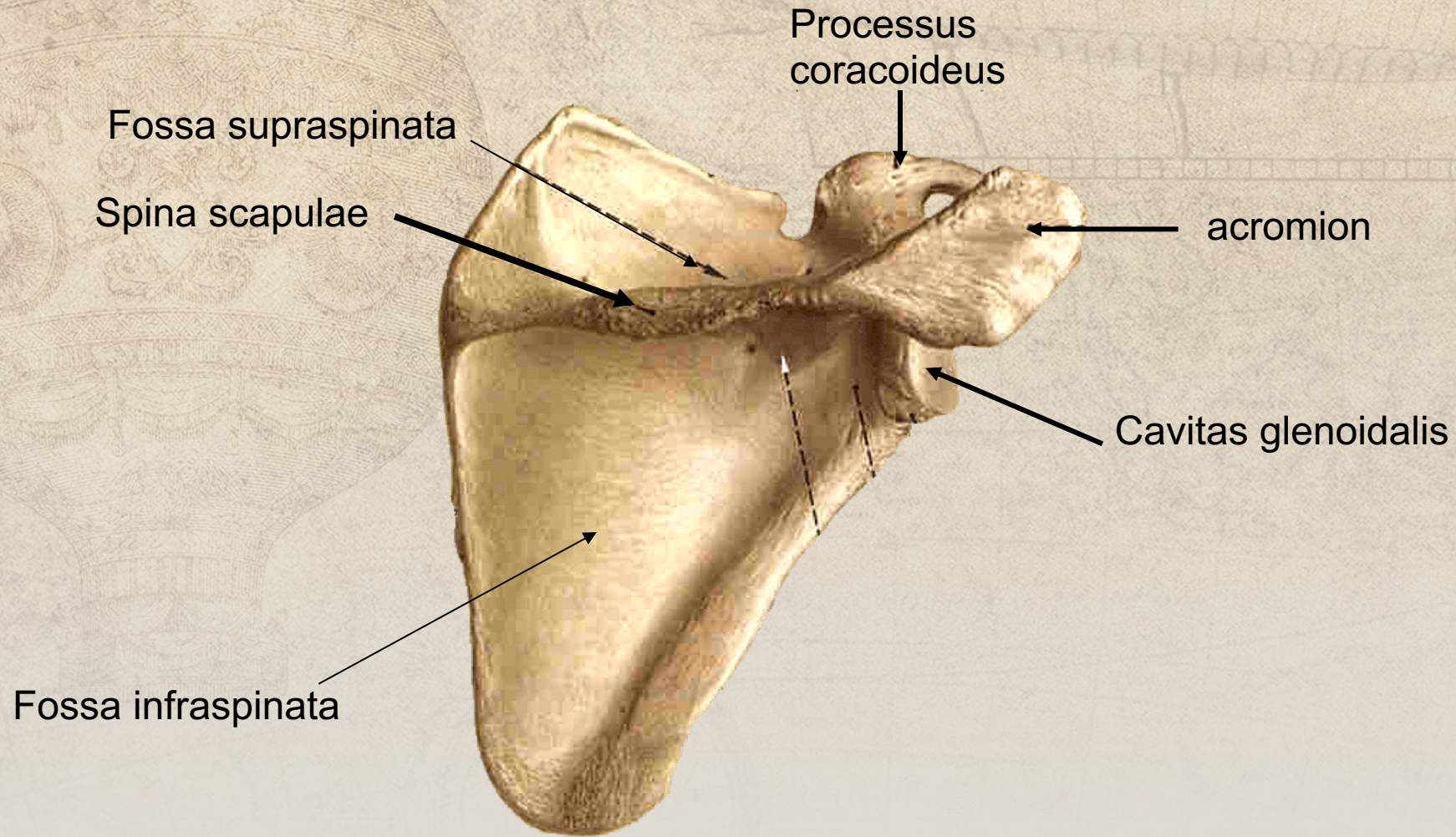
## UGLOVI:

Angulus superior  
Angulus inferior  
Angulus lateralis





# SCAPULA – zadnja strana (facies posterior)





# RAMENICA (humerus)

Delovi:

Gornji okrajak (*extremitas proximalis*)

Telo (*corpus humeri*)

Donji okrajak (*extremitas distalis*)





# RAMENICA (HUMERUS)-SPREDA

Collum anatomicum

Collum chirurgicum

Margo lateralis

Facies anterolateralis

Epicondylus lateralis

Capitulum humeri

Caput humeri

Margo anterior

Margo medialis

Facies anteromedialis

Trochlea humeri

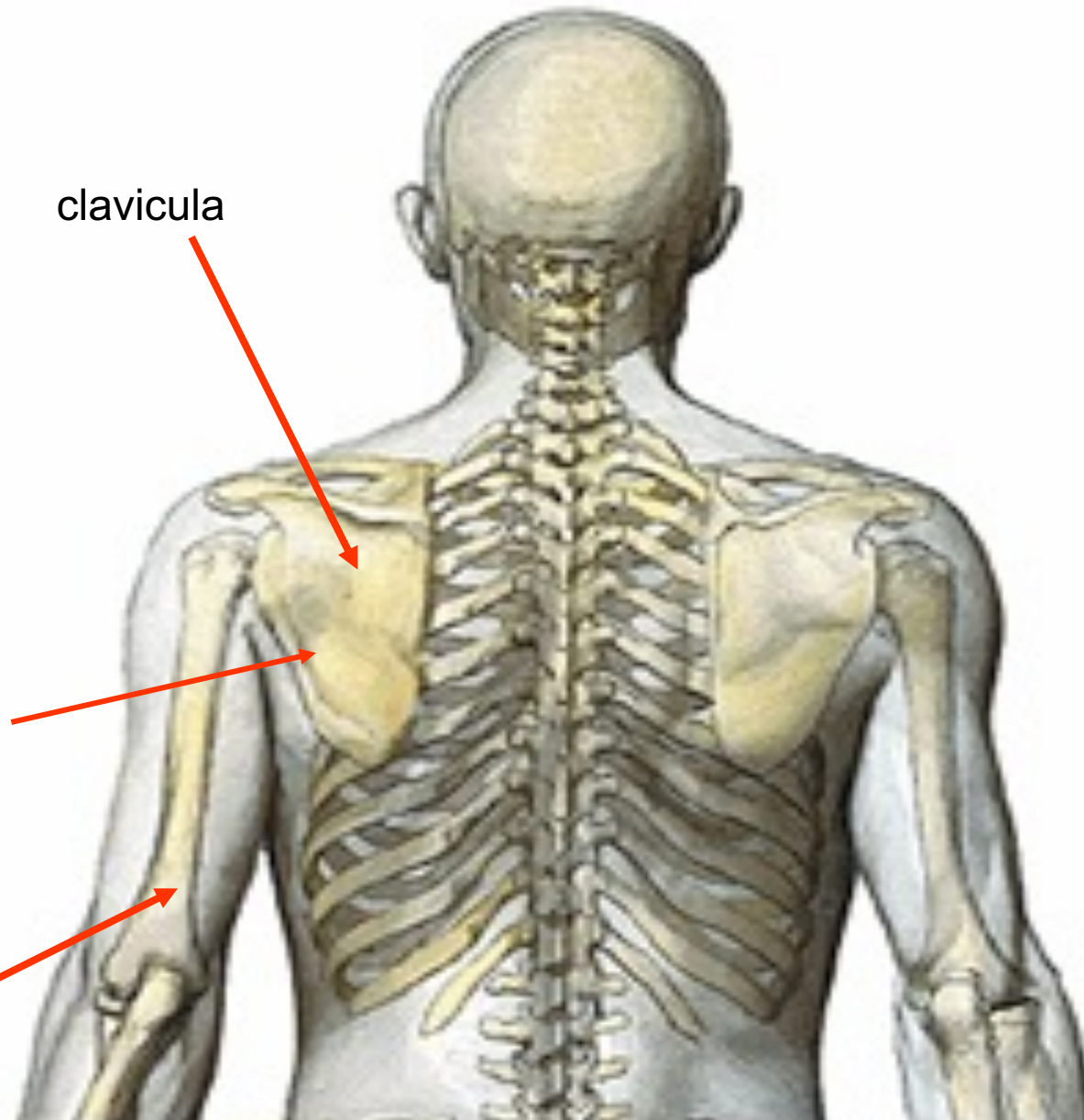
Epicondylus  
medialis



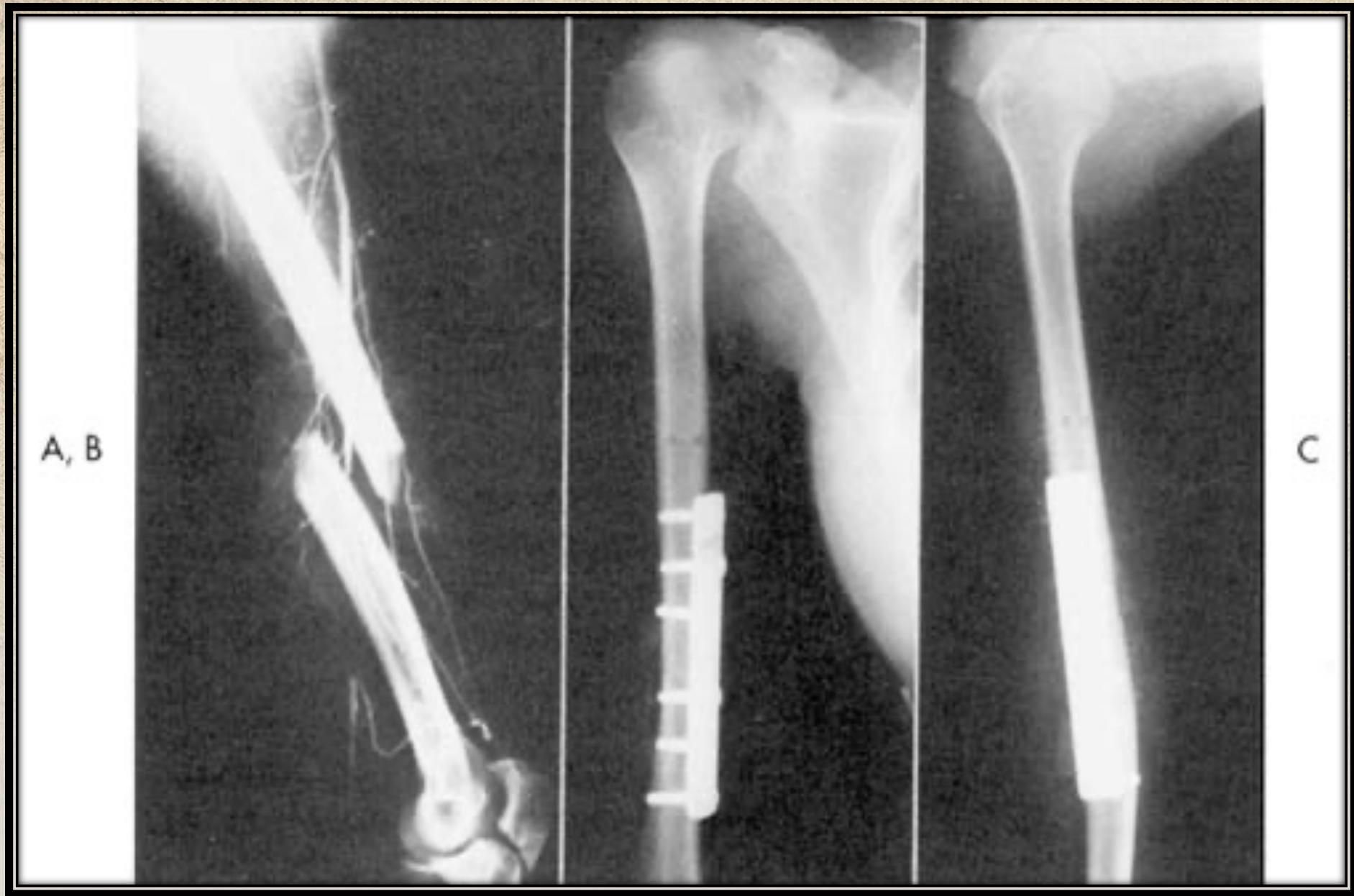
clavicle

scapula

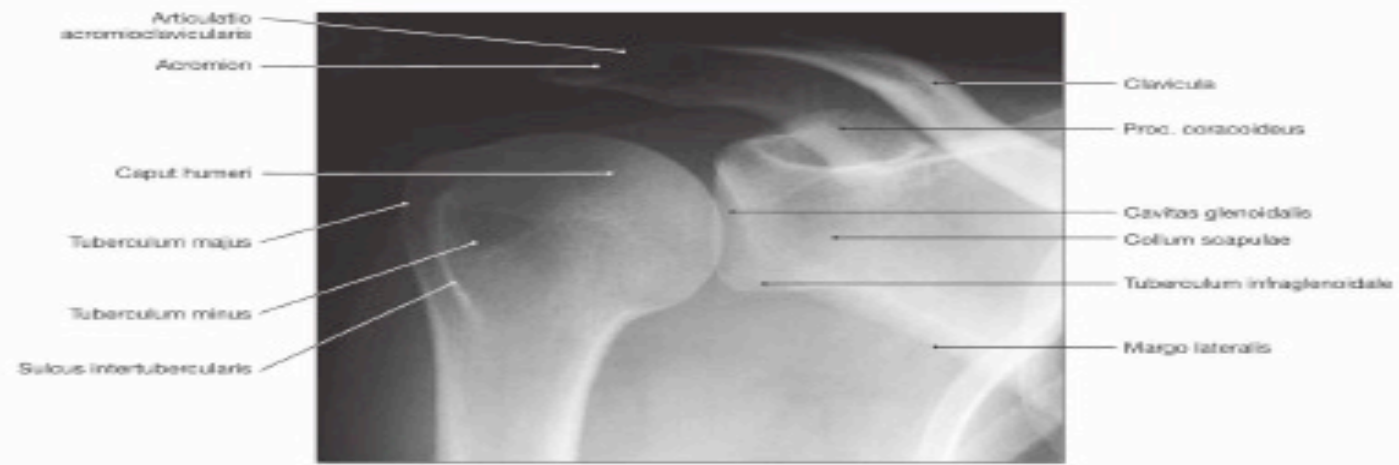
humerus











**Fig. 3.52** Shoulder joint, *Articulatio humeri*, right side; radiograph in anteroposterior (AP) beam projection.





# KOSTI PODLAKTA

**LAKTICA** (*ulna*)

(unutrašnja kost podlakta)

**ŽBICA** (*radius*)

(spoljašnja kost podlakta)

Extremitas proximalis

Corpus

Extremitas distalis



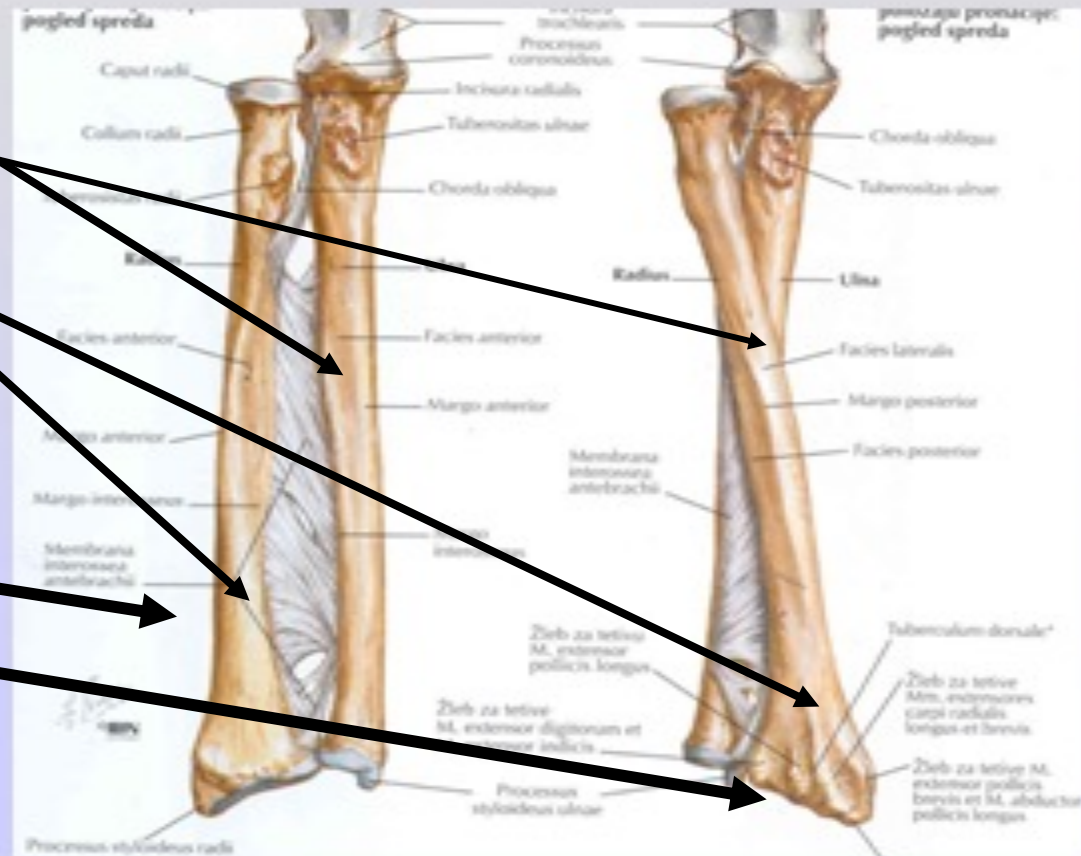


# Kosti podlakta

- Lakatna kost (*ulna*)
- Žbica (*radius*)

## Položaj

- Supinacija
- Pronacija

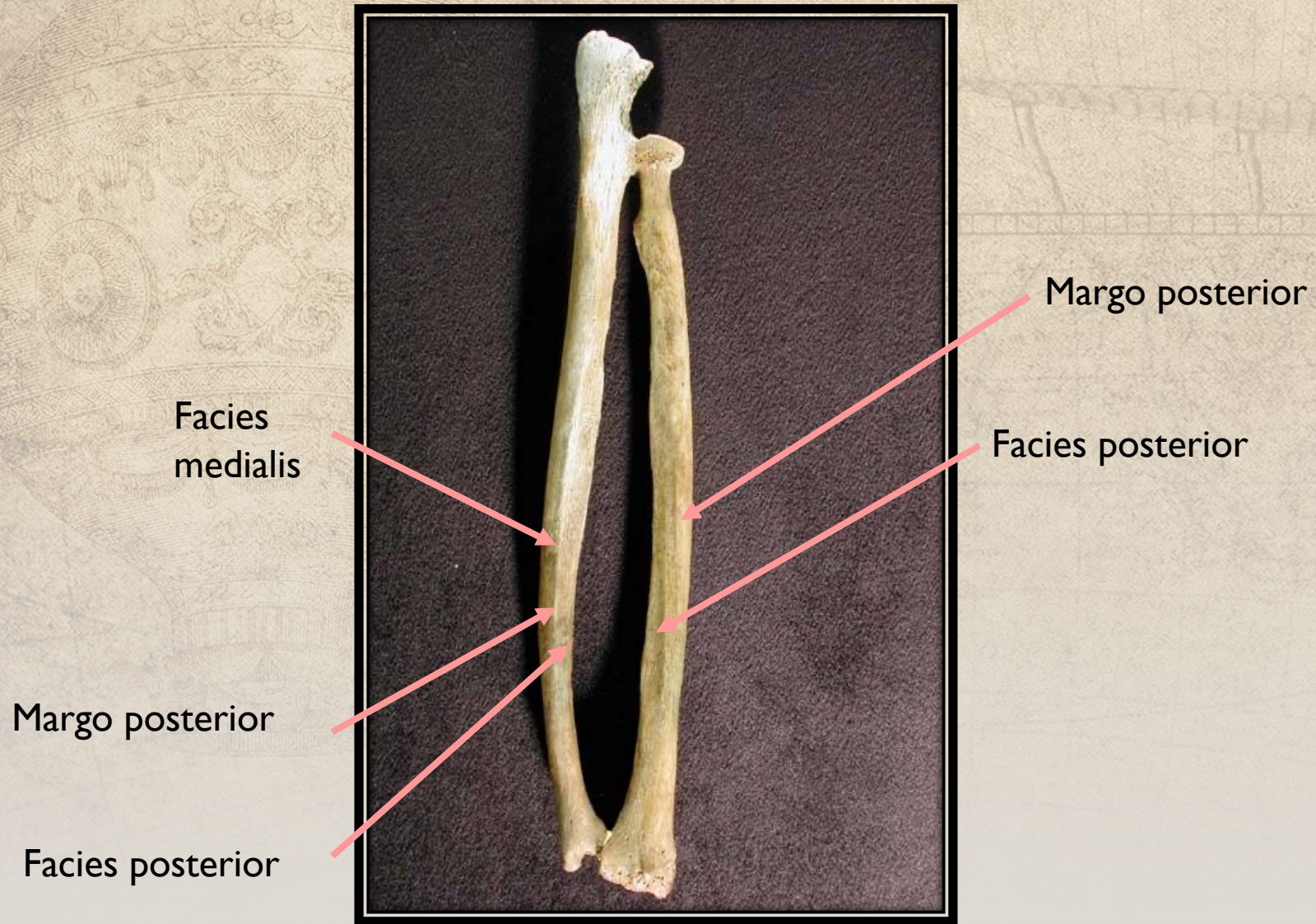


paralelne

ukrštene



# ULNA I RADIUS - pozadi

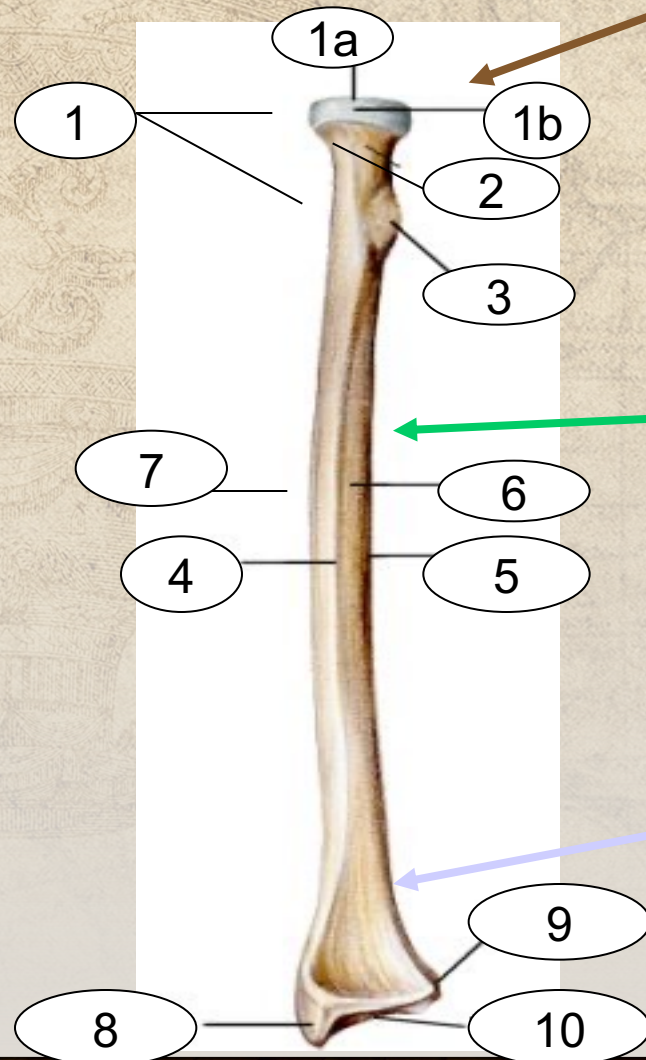








# RADIUS



Extremitas proximalis:

1. **Caput radii**

1a fovea articularis

1b circumferentia articularis

2. **Collum radii**

3. **Tuberositas radii**

Corpus radii:

4. **Margo anterior**

5. **Margo interosseus**

Margo posterior

6. **Facies anterior**

7. **Facies lateralis**

Facies posterior

Extremitas distalis:

8. **Processus styloideus**

9. **Incissura ulnaris**

10. **Facies articularis carpalis**



# ULNA

## Extremitas proximalis:

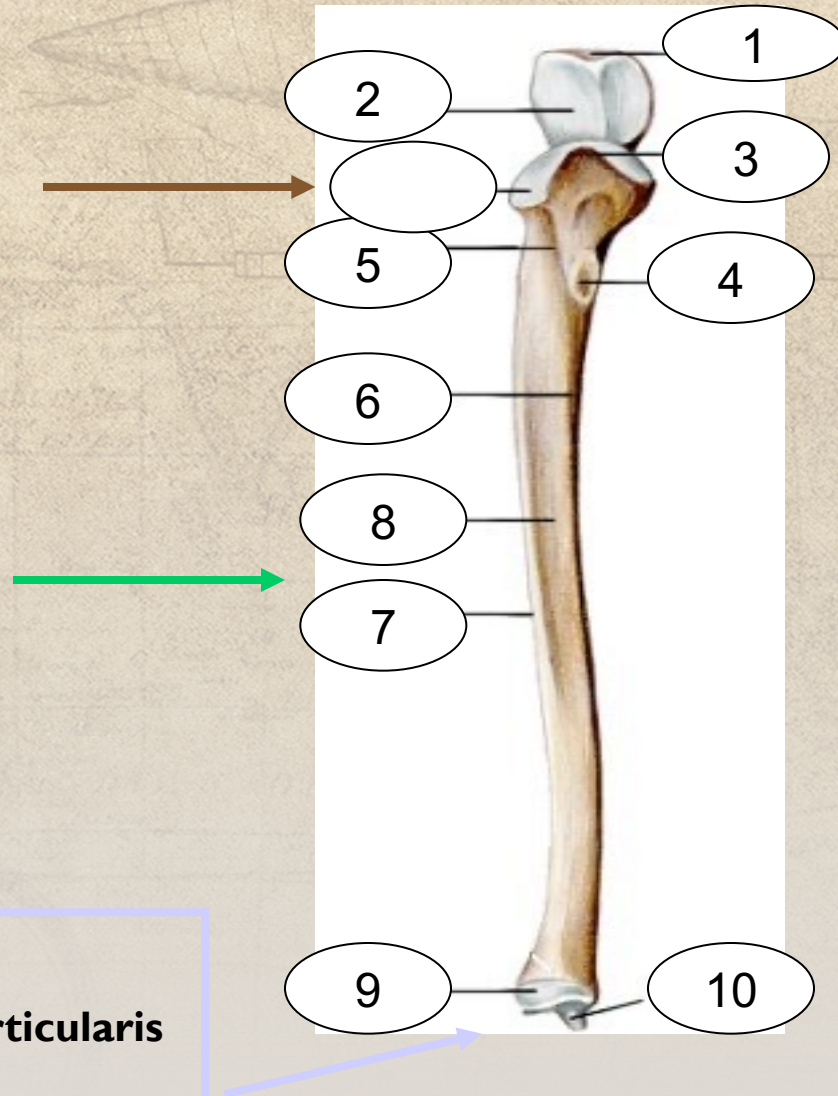
1. Olecranon
2. Incissura trochlearis
3. Processus coronoideus
4. Tuberositas ulnae
5. Incissura radialis

## Corpus ulnae:

6. Margo anterior
7. Margo interosseus  
Margo posterior
8. Facies anterior  
Facies medialis  
Facies posterior

## Extremitas distalis:

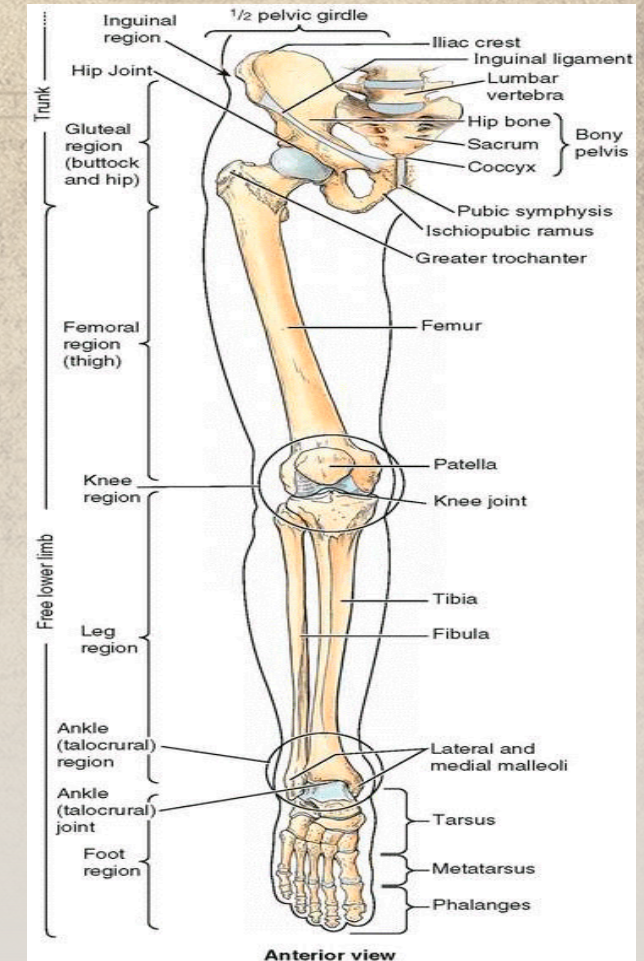
9. Caput ulnae et circumferentia articularis
10. Processus styloideus ulnae





# KOŠTANI SISTEM DONJEG EKSTREMITETA I KARLICE

- **Kosti karličnog pojasa os coxae**
  - os sacrum
  - os coccygis
- Kosti slobodnog dela donjeg ekstremiteta
  - Natkolenica:
    - butna kost (femur)
    - čašica (patella)
  - Potkolenica:
    - golenjača (tibia)
    - lišnjača (fibula)
  - Kosti stopala (ossa pedis):
    - ossa tarsi
    - ossa metatarsi
    - ossa digitorum pedis



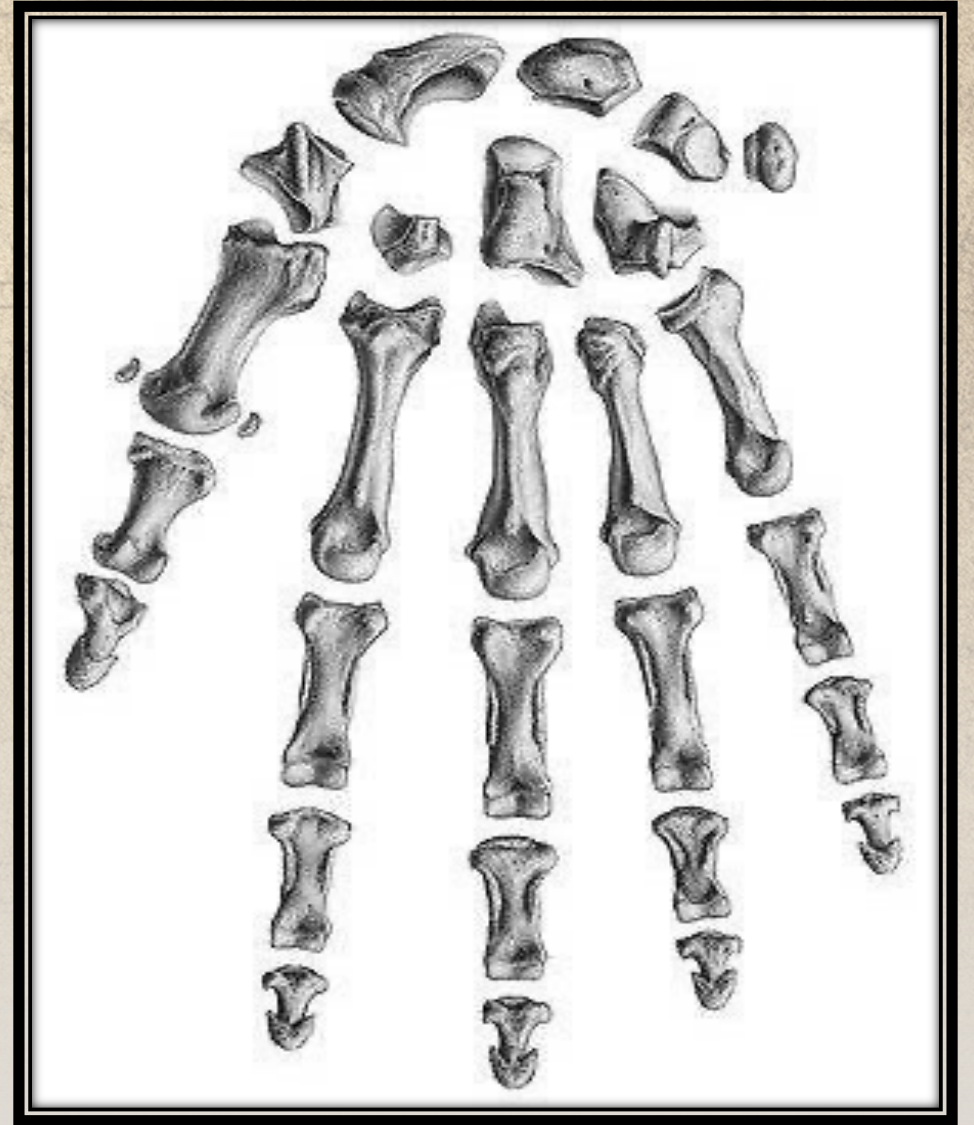


# OSSA MANUS

**RUČJE** (*ossa carpi*) ili **CARPUS**

**DORUČJE** (*ossa metacarpi*) ili  
**METACARPUS**

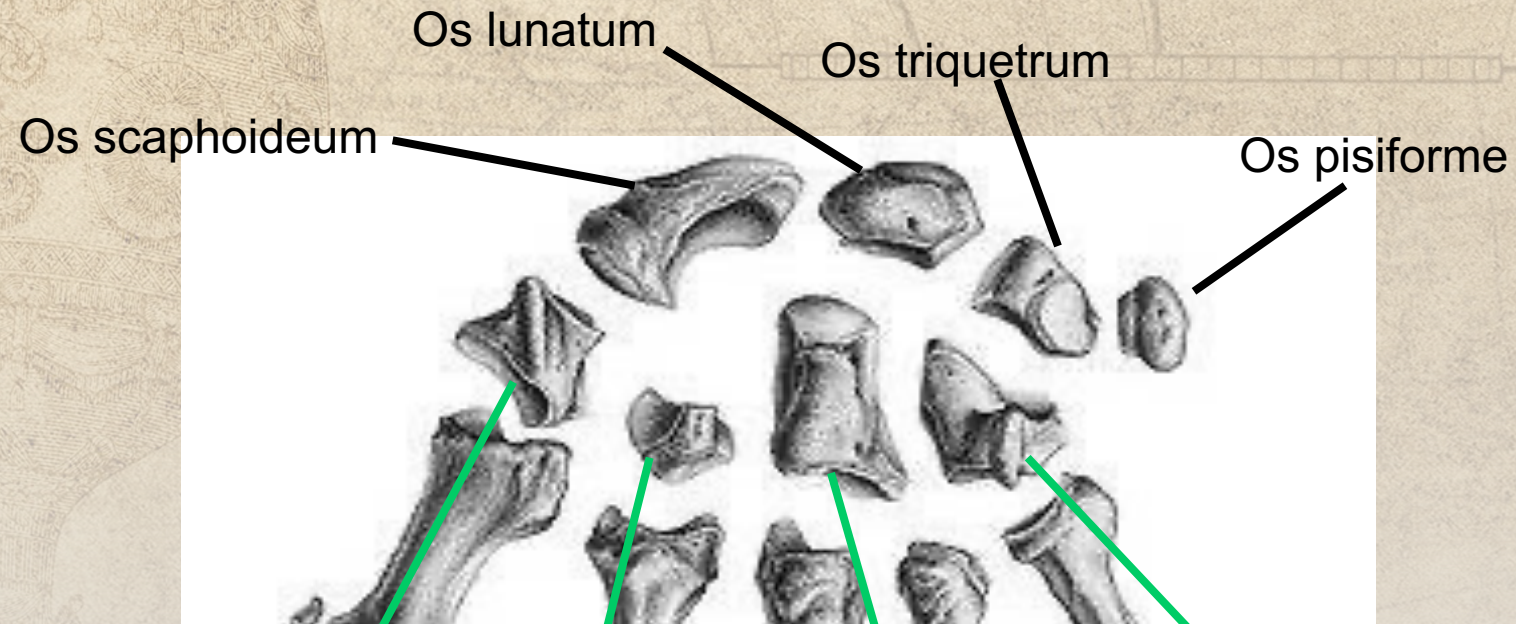
**KOSTI ZA PRSTE**  
(*ossa digitorum manus*)



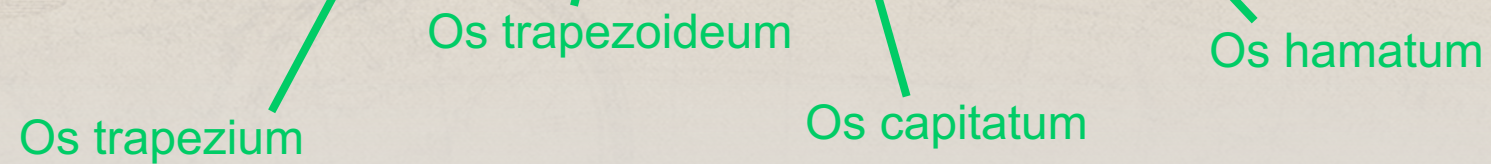


# OSSA CARPI

## PROKSIMALNI RED

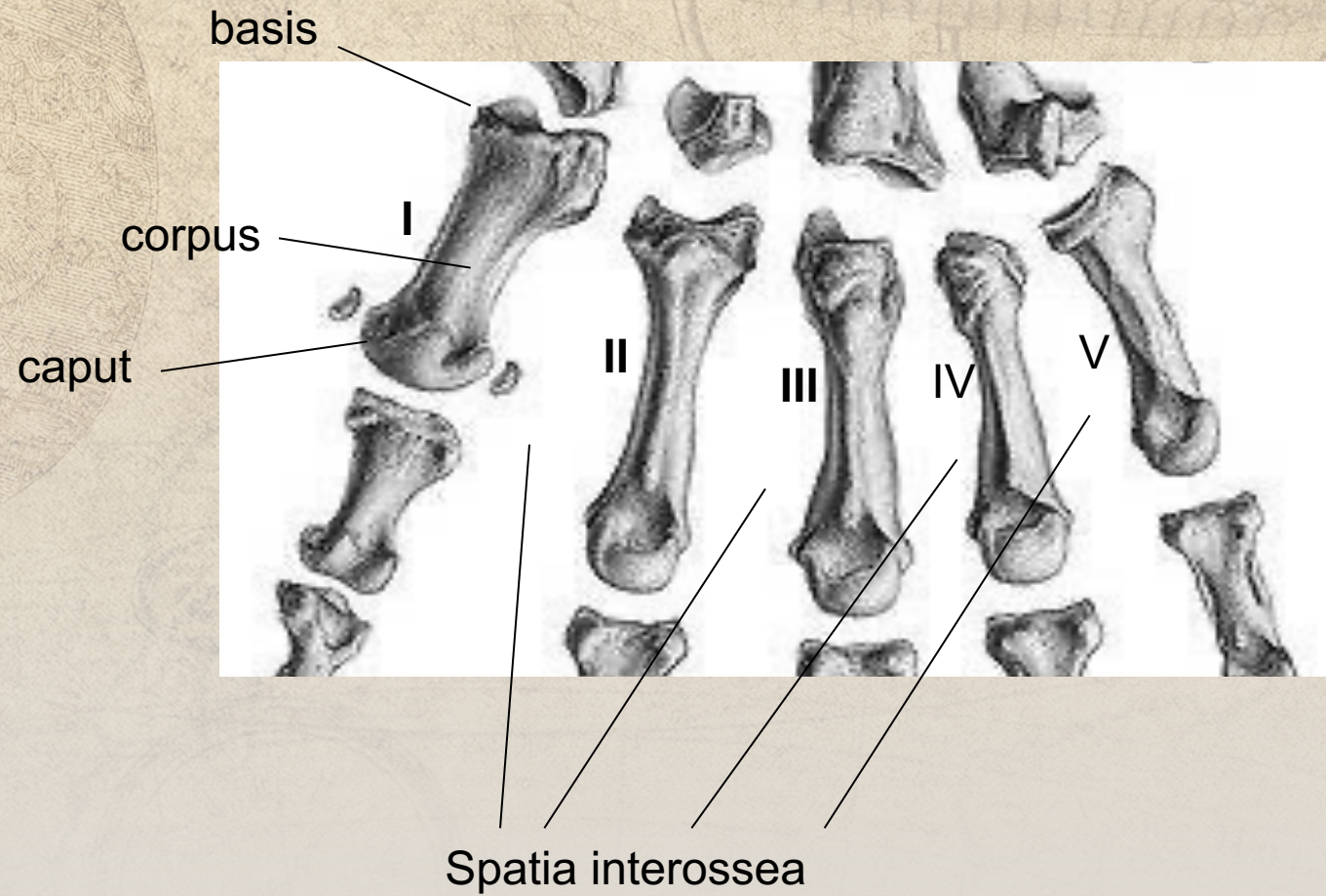


## DISTALNI RED





# OSSA METACARPI





# OSSA DIGITORUM MANUS

Phalangs proximalis

Phalangs distalis

Pollex, pollicis

Index, indicis

Digitus medius

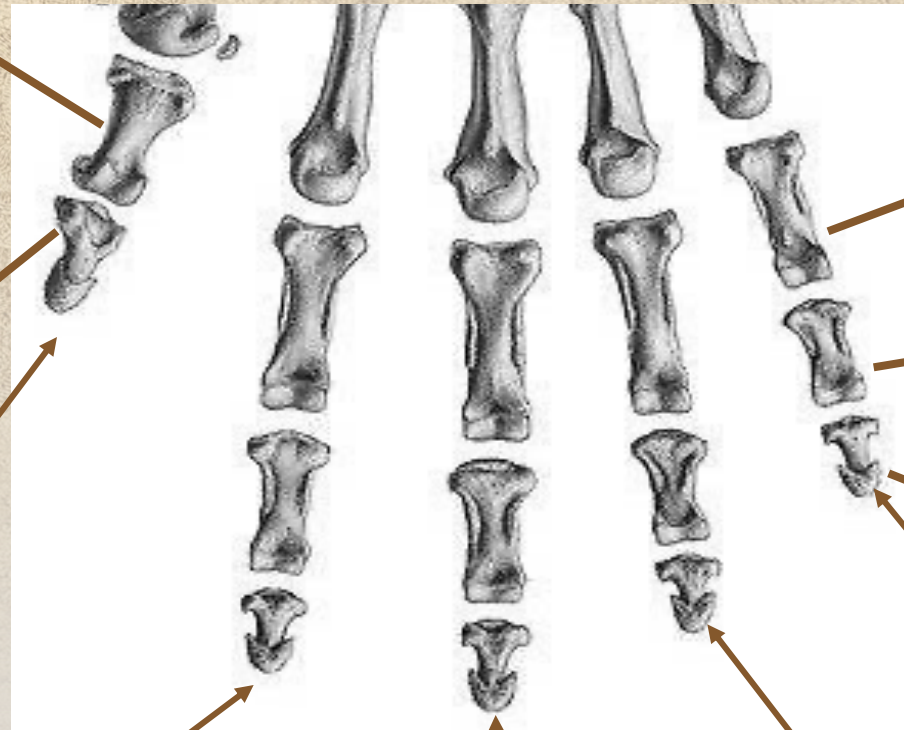
Digitus anularis

Phalangs proximalis

Phalangs medialis

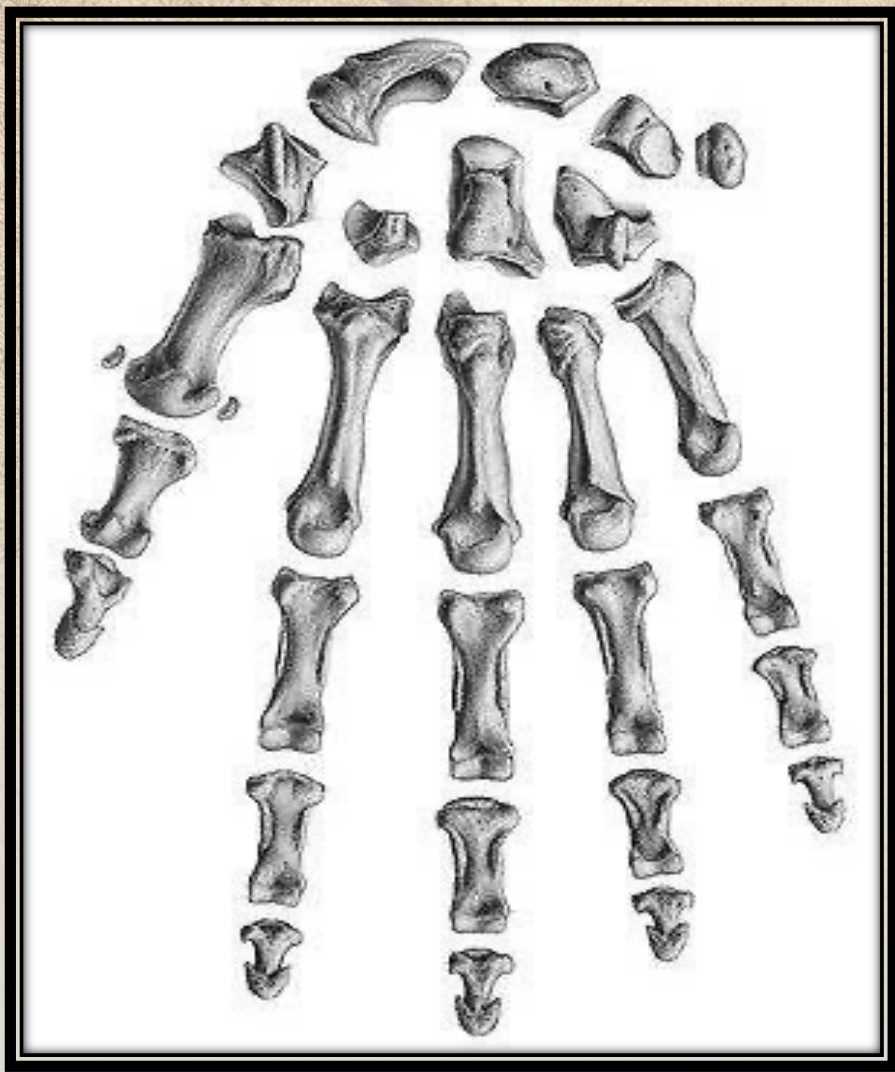
Phalangs distalis

Digitus minimus (quintus)



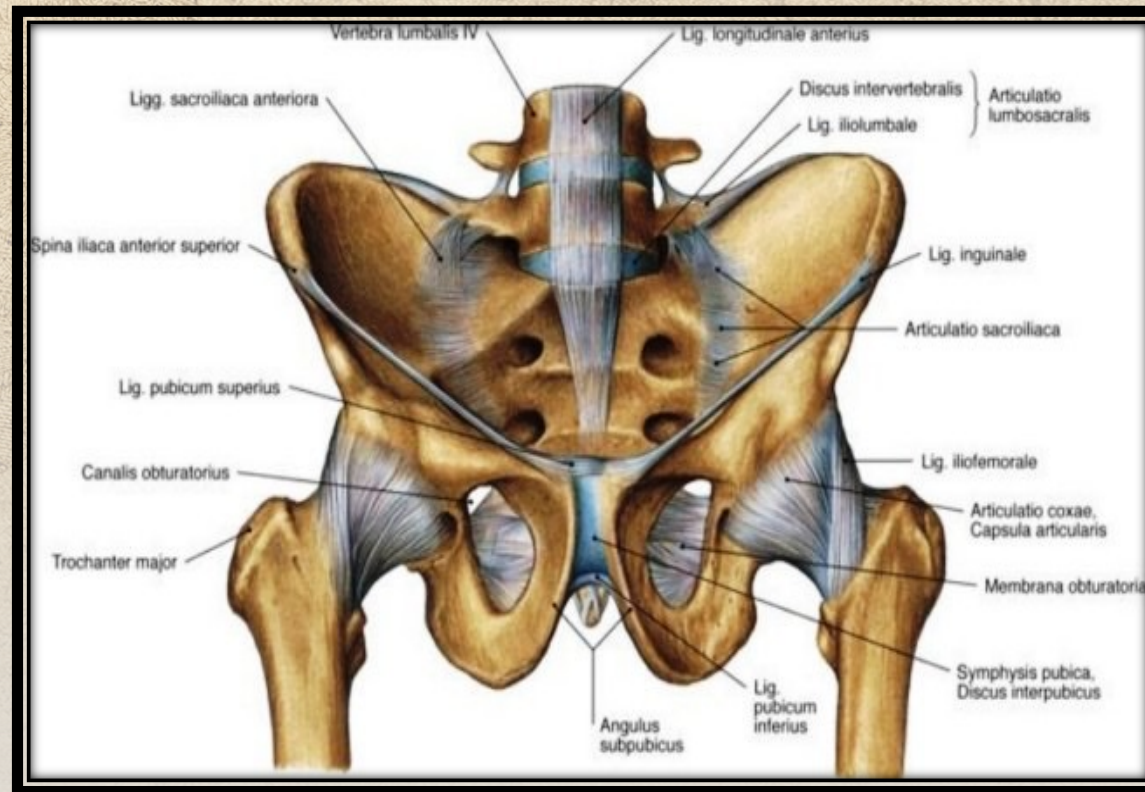


# OSSA MANUS





# KOŠTANI SISTEM KARLICE

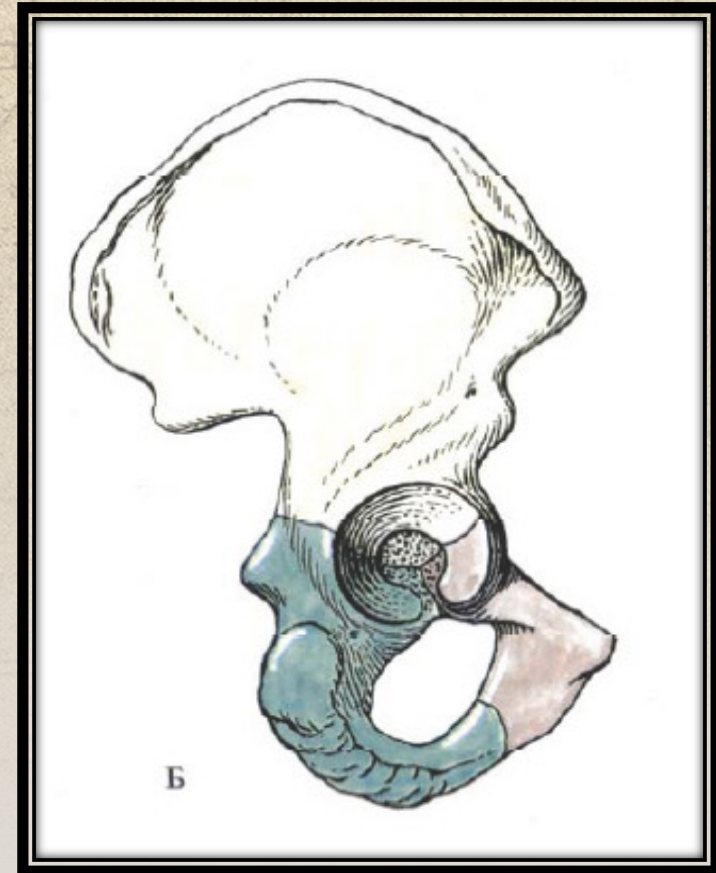




# KOSTI KARLIČNOG POJASA - OS COXAE

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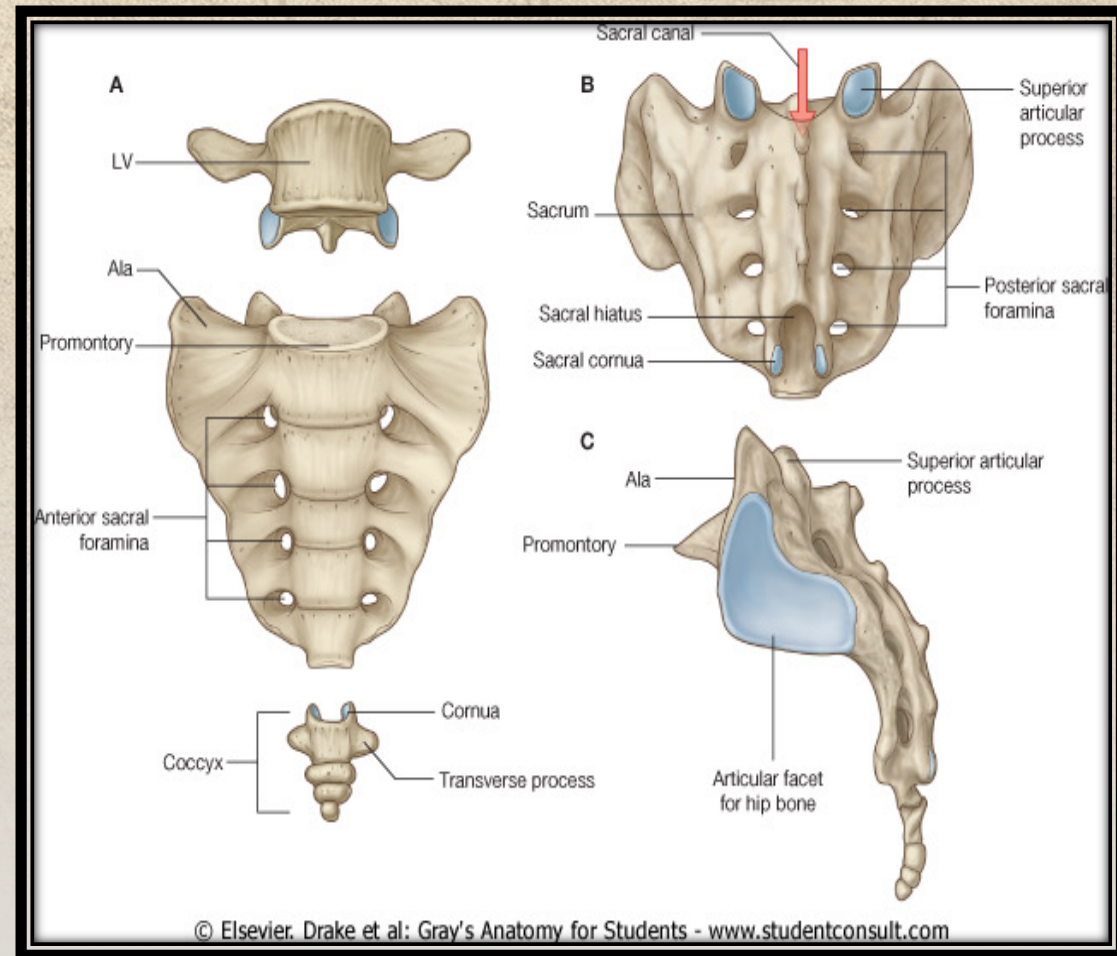
- Do puberteta ova kost se sastoji iz tri kosti koje su povezane hrskavicom u predelu zglobne čašice (acetabulum):
  - Os ilium
  - Os pubis
  - Os ischii





# KOSTI KARLIČNOG POJASA - OS SACRUM

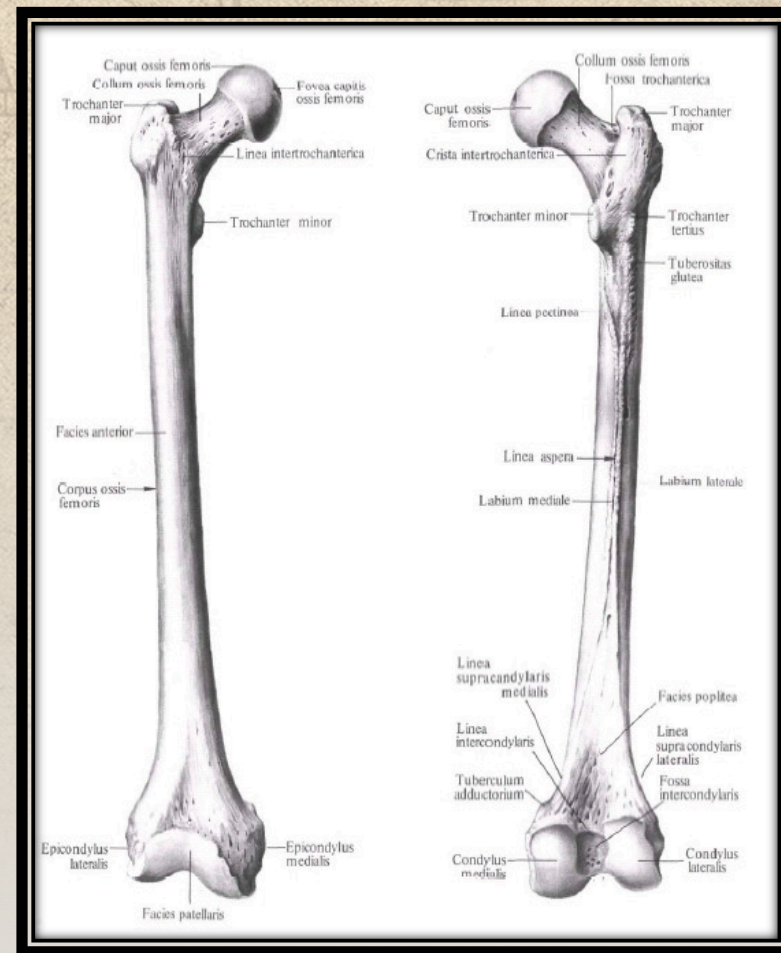
- Kost oblika četverostrane piramide koja se nalazi na zadnjem zidu pelvis minor i nastala je srastanje 5 krsnih pršljenova (vertebrae sacrales)
- Opisuju joj se:
  - Strane:
    - Facies pelvica
    - Facies dorsalis
  - Basis ossis sacri
  - Apex ossis sacri
  - Dve bočne strane
  - Canalis sacralis





# KOSTI DONJEG EKSTREMITETA - FEMUR

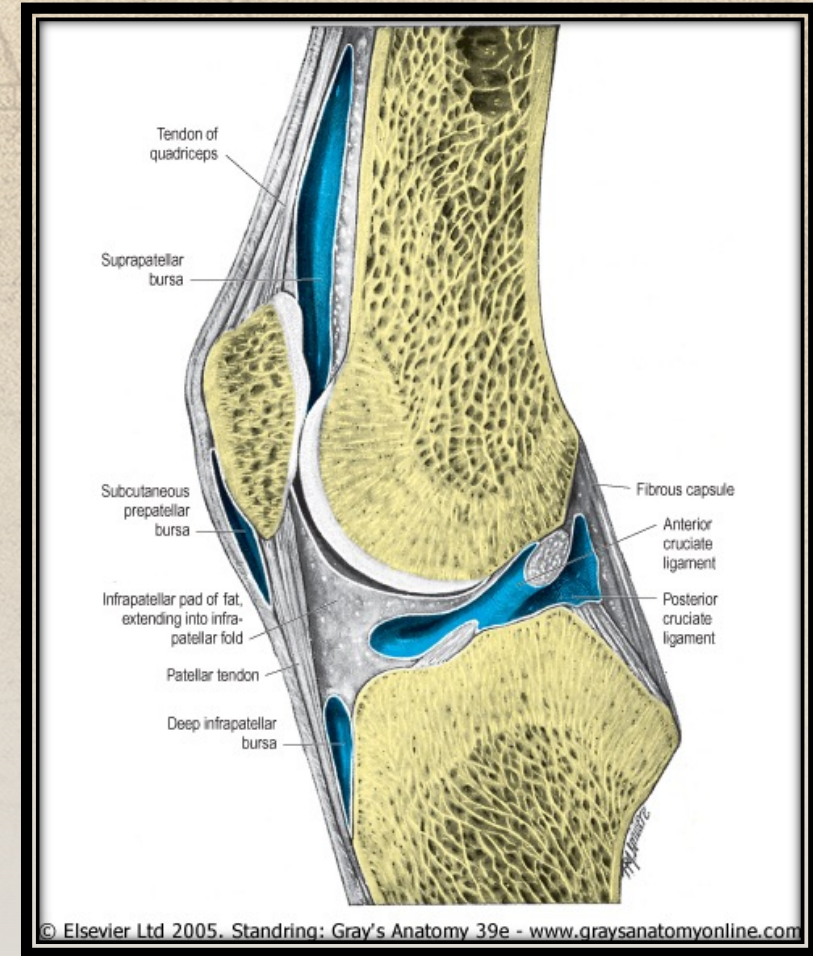
- Jedina kost donjeg ekstremiteta koja se nalazi u natkolenici
- Po tipu duga kost, koja se proksimalno zglobljava sa os coxae, a distalno sa patelom i tibiom
- Delovi - sastoji se iz:
  - Tela (corpus femoris)
  - Gornjeg okrajka (extremitas superior-proximalis)
  - Donjeg okrajka (extremitas inferior-distalis)





# KOSTI DONJEG EKSTREMITETA - PATELLA

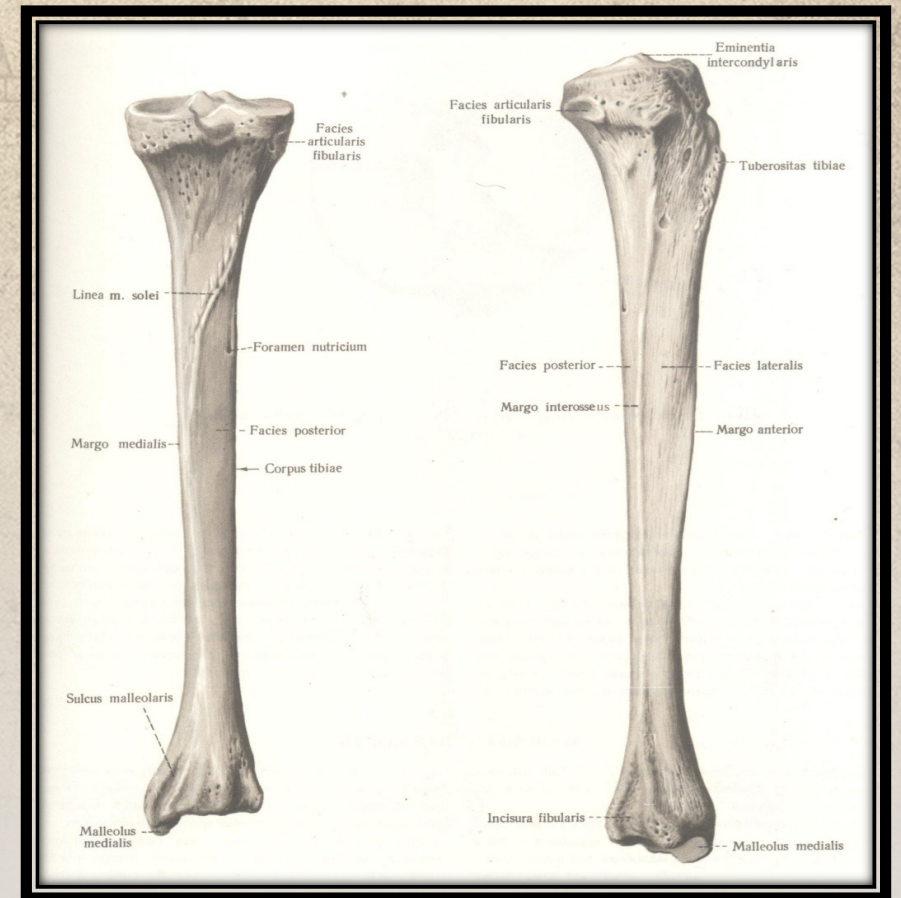
- Sezamoidna kost koja se nalazi u tetivi m. quadriceps femoris-a i učestvuje u formiranju zgloba kolena
- Trouglastog oblika sa vrhom okrenutim naniže, a bazom okrenutom naviše
  - Za bazu se pripaja donji kraj m. quadriceps femoris-a
  - Od vrha se pruža do golenjačne kvrge lig. patellae





# KOSTI DONJEG EKSTREMITETA - TIBIA

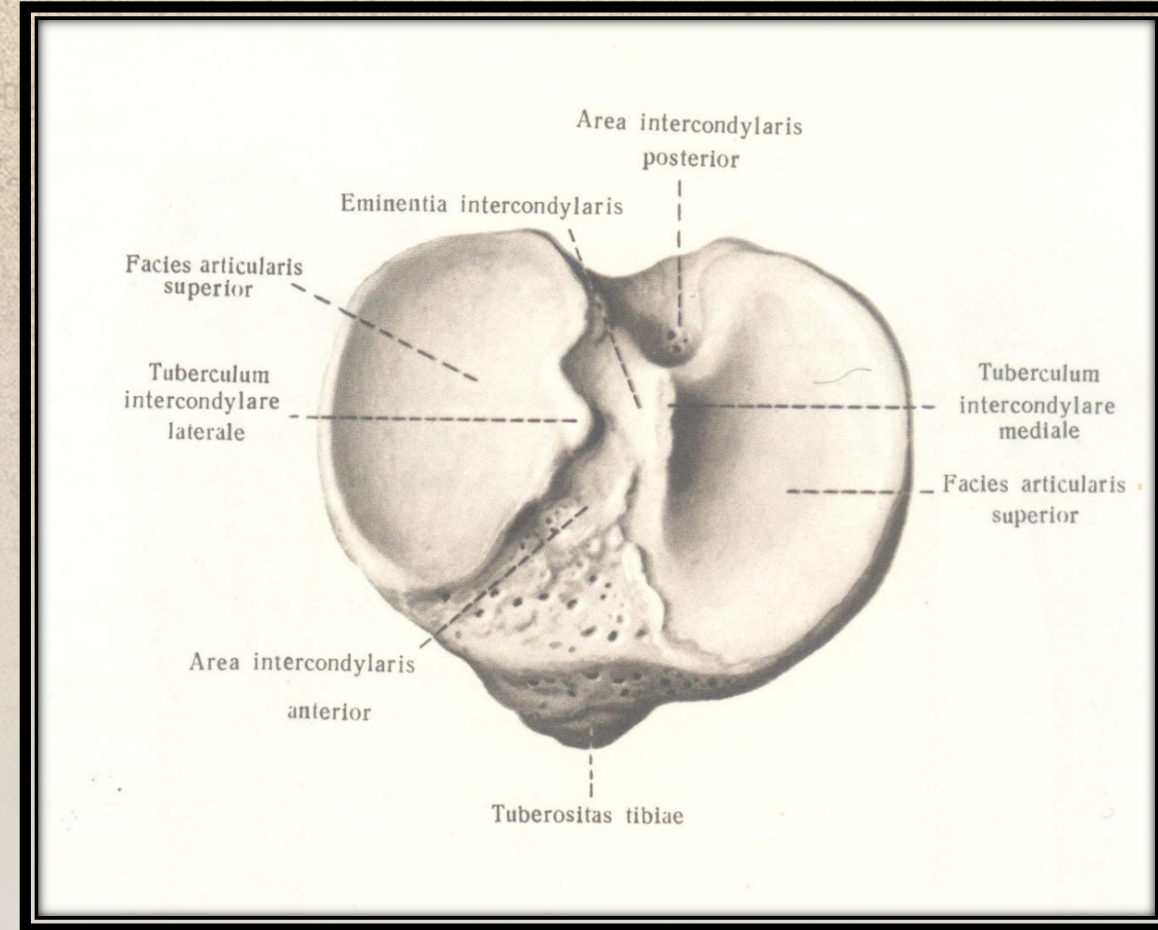
- Unutrašnja kost potkolenice. Duga kost na kojoj se opisuju dva okrajka i telo.
- Okrajci:
  - Gornji
  - Donji
- Gornji okrajak:
  - Oblika zarubljene četvorostrane piramide čija je šira baza okrenuta naviše, a uža baza okrenuta naniže i nastavlja se telom golenjače.
  - Sastoji se iz dva koštana ispupčenja, spoljašnjeg (condylus lateralis) i unutrašnjeg (condylus medialis).
  - Opisuju mu se gornja strana i obod (prednja, zadnja, spoljašnja i unutrašnja strana)





# KOSTI DONJEG EKSTREMITETA - TIBIA

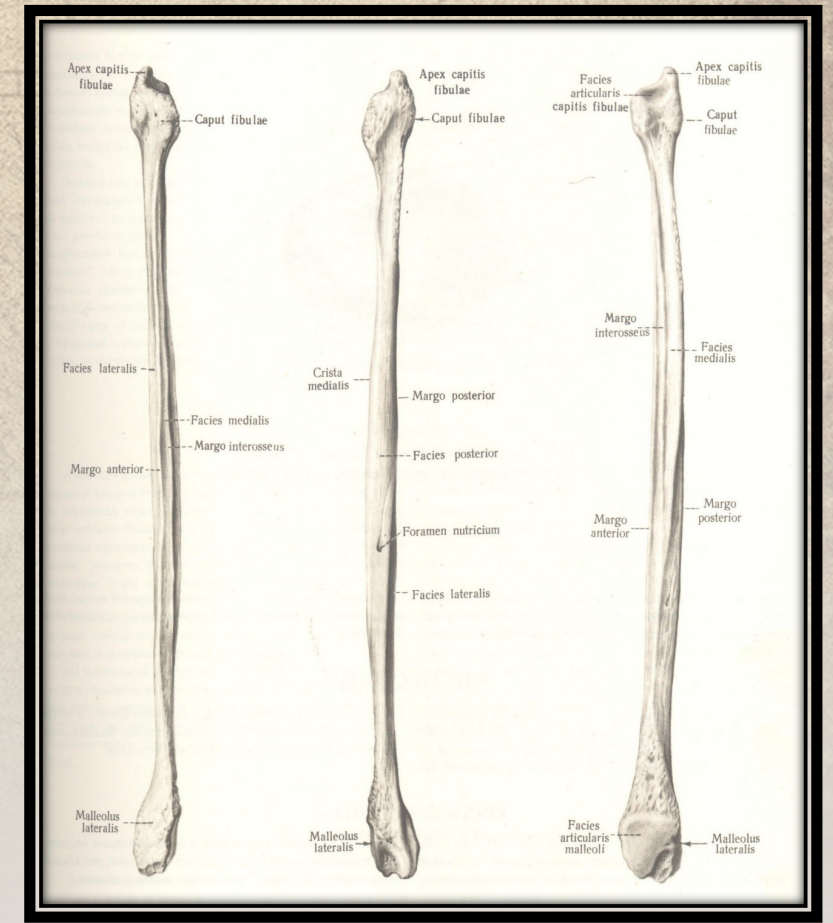
- Gornja strana (baza):
- Zglobne površine kondilusa koje daju facies articularis superior tibiae
- Između zglobnih površina kondila nalaze se:
  - Eminentia intercondylaris u sredini
  - Napred - area intercondylaris anterior za koju se pripajaju idući od spreda put pozadi:
    - Meniscus medialis – prednji rog
    - Lig. cruciatum anterior
    - Meniscus lateralis – prednji rog
  - Pozadi - area intercondylaris posterior za koju se pripajaju idući od spreda put pozadi:
    - Meniscus lateralis – zadnji rog
    - Meniscus medialis – zadnji rog
    - Lig. cruciatum posterior





# KOSTI DONJEG EKSTREMITETA FIBULA

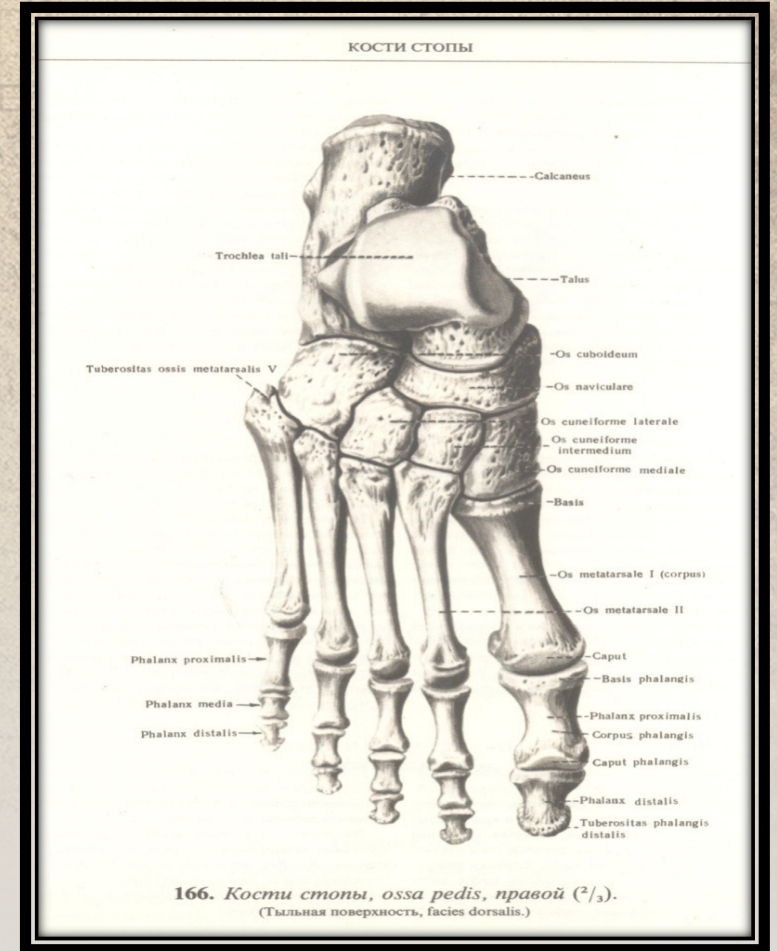
- Spoljašnja kost potkolenice
- Delovi:
  - Gornji okrajak
  - Donji okrajak
  - Telo (corpus fibulae)
- Gornji okrajak:
  - Caput fibulae:
    - Okrenuta prema unutra, koso postavljena zglobna glačica glave fibule (facies articularis capitis fibulae)
    - Pozadi zglobne glačice koštani nastavak apex capitis fibulae
  - Collum fibulae
    - Preko spoljašnje strane prelazi n. peroneus (fibularis) communis
  - Pripoji:
    - M. biceps femoris – apex capitis fibulae
    - M. soleus – zadnja strana glave i vrata fibulae





# KOSTI STOPALA (OSSA PEDIS)

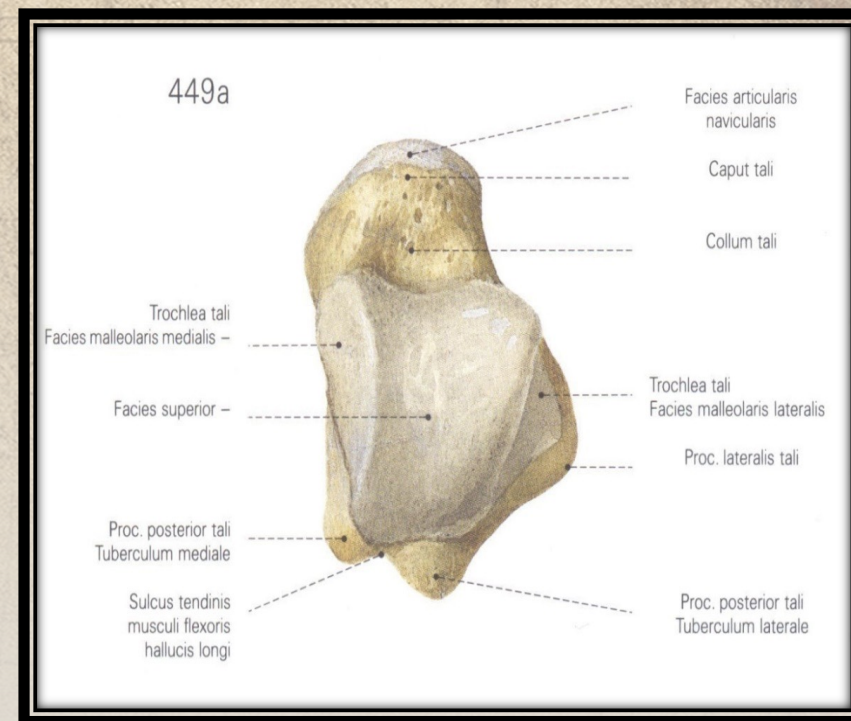
- Kosti nožja (ossa tarsi)
- Kosti donožja (ossa metatarsi)
- Kosti prstiju (ossa digitorum pedis)
- Ossa tarsi:
  - Zadnji red:
    - Skočna kost (talus)
    - Petna kost (calcaneus)
  - Prednji red:
    - Kockasta kost (os cuboideum)
    - Čunasta kost (os naviculare)
    - Klinaste kosti:
      - Unutrašnja (os cuneiforme mediale)
      - Srednja (os cuneiforme intermedium)
      - Spoljašnja (os cuneiforme laterale)





# SKOČNA KOST (TALUS)

- Delovi:
  - Telo (corpus)
  - Vrat (collum)
  - Glava (caput)
- Telo skočne kosti:
  - Gornja strana:
    - Kolotur (trochlea tali) – nosi zglobne površine za zglobljavanje sa donjim okrajcima kostiju potkolenice
  - Donja strana:
    - Tri zglobne glačice za petnu kost
- Glava skočne kosti:
  - Zglobna glačica za čunastu kost
- Vrat skočne kosti:
  - Hrapavi deo koji povezuje glavu sa telom





# PETNA KOST (CALCANEUS)

- Ima oblik kvadra i opisuju joj se šest strana:
  - Prednja – zglobna glavičica za kockastu kost
  - Zadnja – tuber calcanei za pripoj Ahilove tetive
  - Gornja – zglobne glavičice za skočnu kost
  - Donja
  - Spoljašnja
  - Unutrašnja

