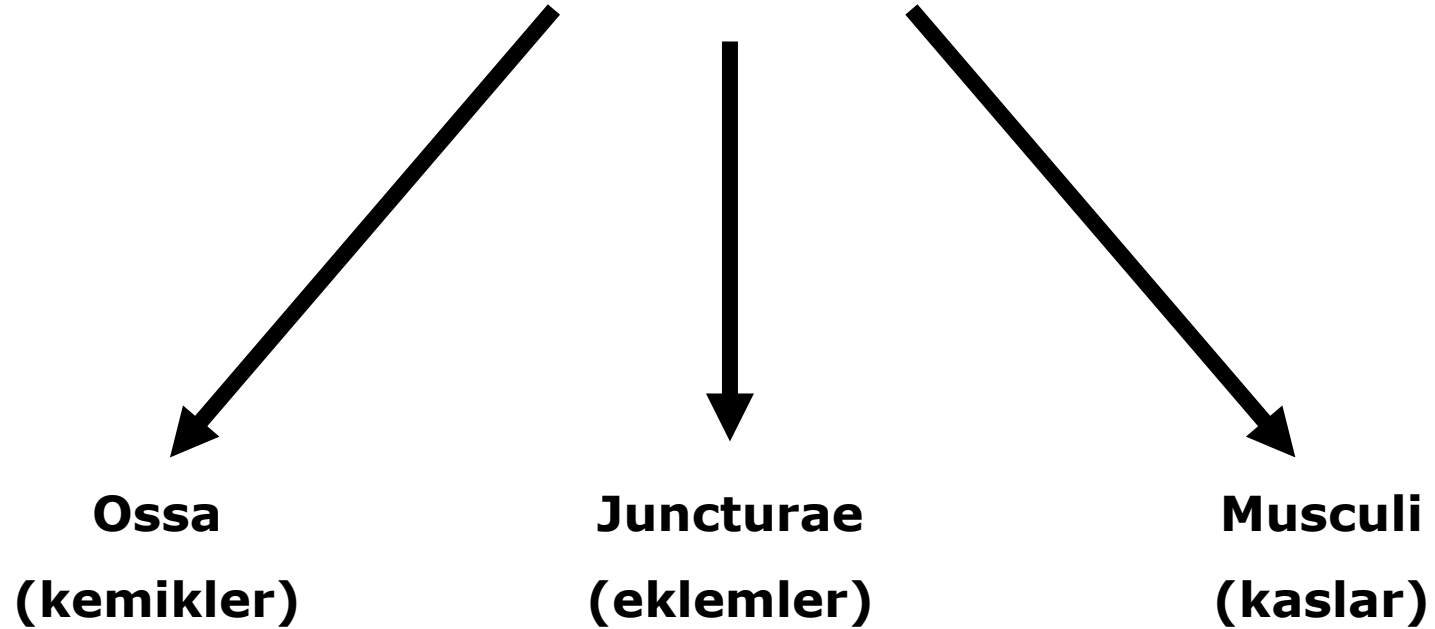


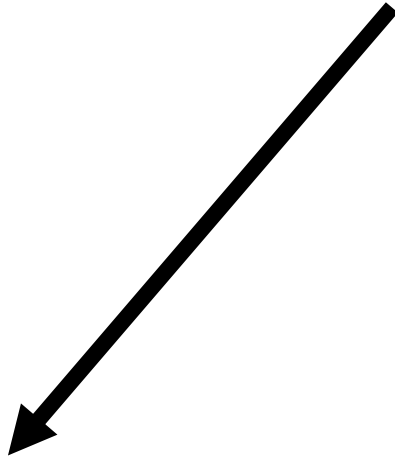
HAREKET SİSTEMİ

SYSTEMA LOCOMOTORIA

HAREKET SİSTEMİ



HAREKET SİSTEMİ



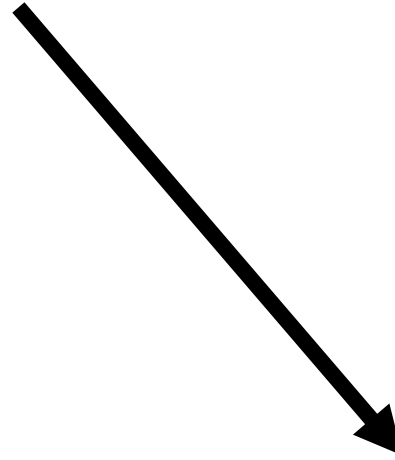
Osteologia

(kemikleri inceleyen
bilim dalı)



Arthrologia

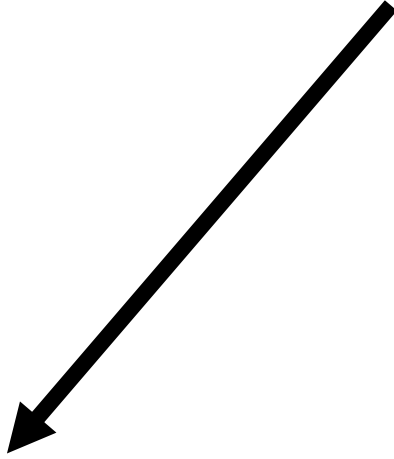
(eklemleri inceleyen
bilim dalı)



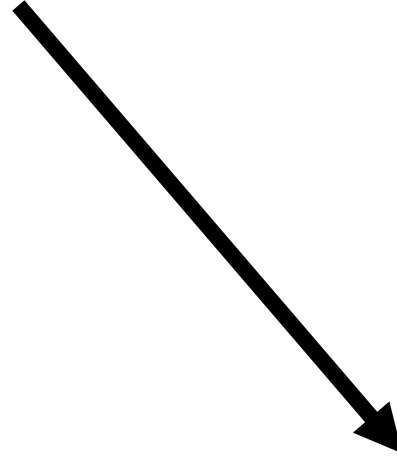
Myologia

(kasları inceleyen
bilim dalı)

HAREKET



Pasif Unsurları
(kemikler, eklemler)



Aktif Unsurları
(kaslar)

Vücut parçasını hareket ettirebilmek için gerekli kuvvet, motor görevini üstlenen kaslar tarafından meydana getirirler.

Kemikler harekete destek verirler.

Tendonlar (Kirişler) ise, kasların meydana getirdiği kuvveti kemiklere naklederler.

KEMİKLER

Kemiğin görevleri

- **Mineral deposu**
- **Destek**
- **Koruma**
- **Hareket sistemini önemli bir kısmı.**
- **Hematopoesis**

Vücudumuzda kaç kemik vardır ?

Skeleton axiale

Neurocranium

Viscerocranium

Os hyoideum

Columna vertebralis

Skeleton thoracis

Skeleton appendiculare

Membrum superius

Membrum inferius

Kafa kemikleri

Viscerocranium

Os maxillae (2)
Os zygomaticum (2)
Os nasale (2)
Os vomer (1)
Concha nasi inferior (2)
Os lacrimale (2)
Os mandibulae (1)
Os palatinum (2)
Malleus (2)
Incus (2)
Stapes (2)

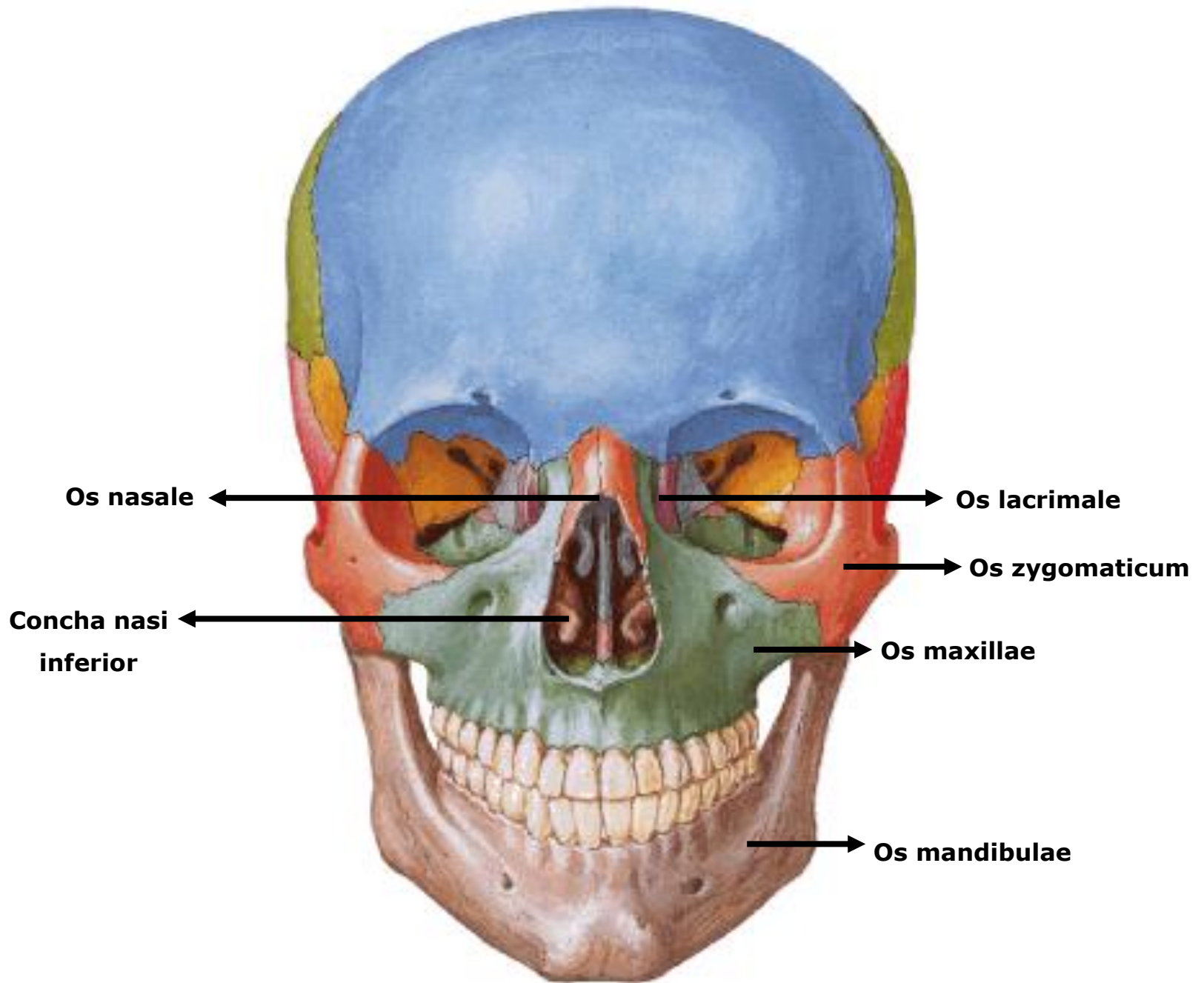
Toplam: 20

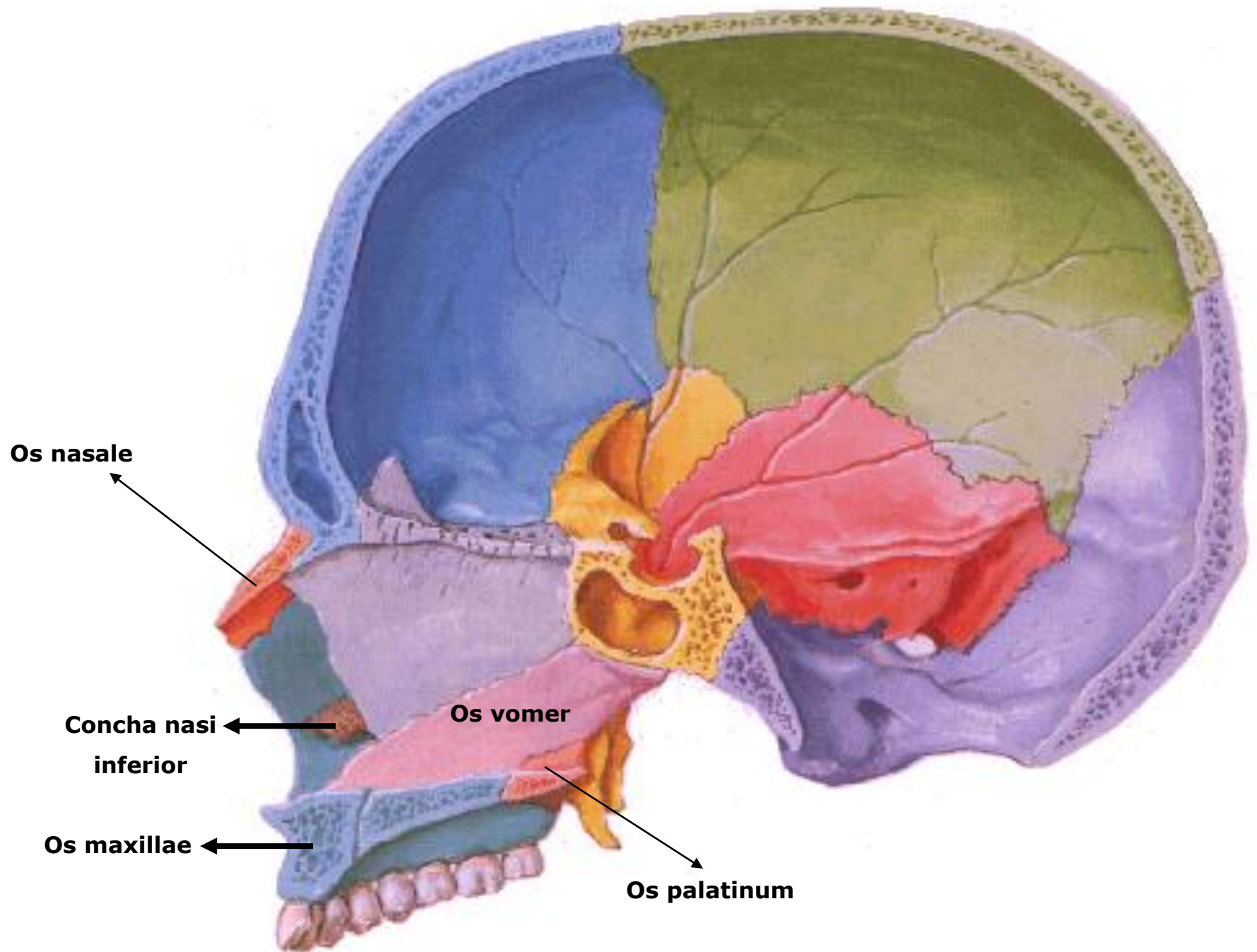
Toplam: 28

Neurocranium

Os frontale (1)
Os occipitale (1)
Os sphenoidale (1)
Os parietale (2)
Os temporale (2)
Os ethmoidale (1)

Toplam: 8

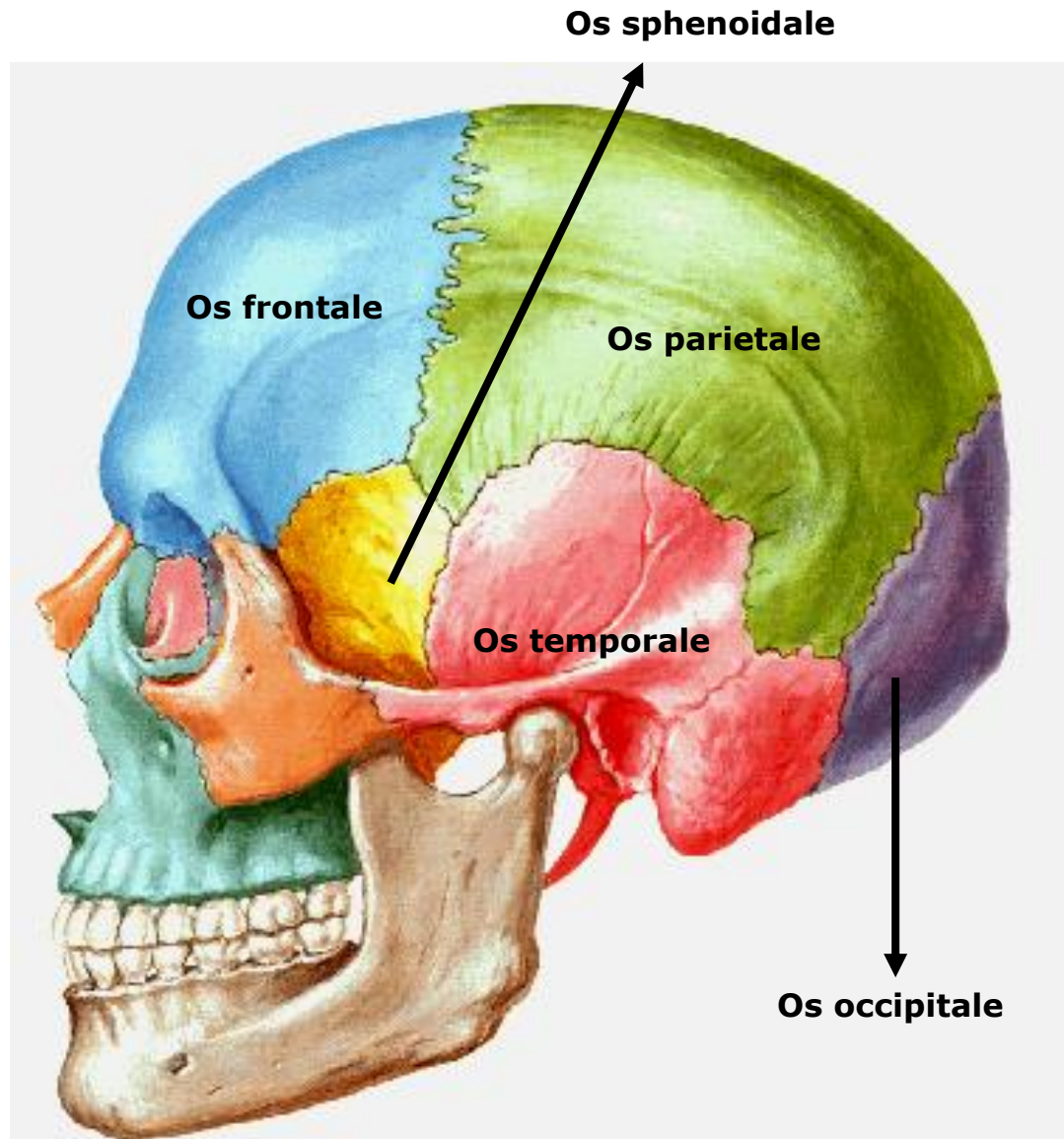
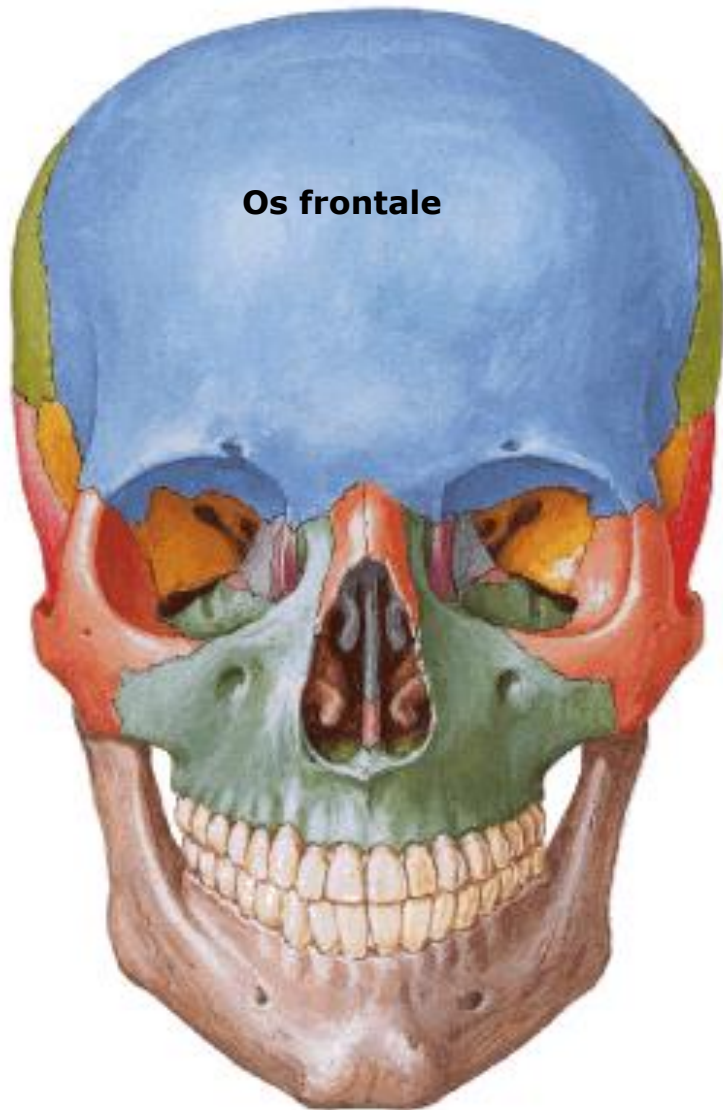


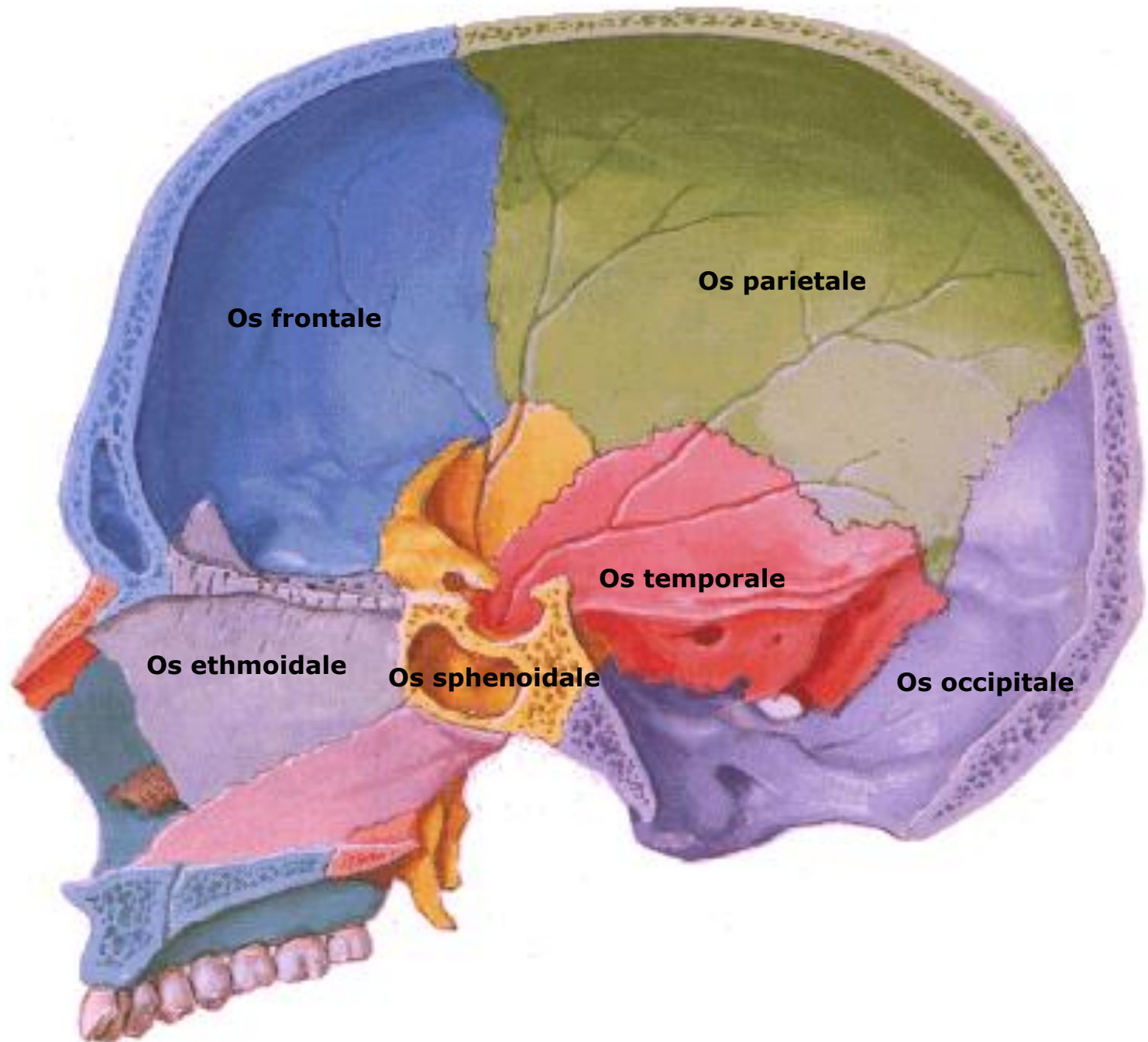


*Ossicula
auditus*



Malleus Incus Stapes





Columna vertebralis

Presakral vertebralar

Vertebrae cervicales (7)

Atlas

Axis

3. servikal vertebra

4. servikal vertebra

5. servikal vertebra

6. servikal vertebra

7. servikal vertebra

Vertebrae thoracicae (12)

Vertebrae lumbales (5)

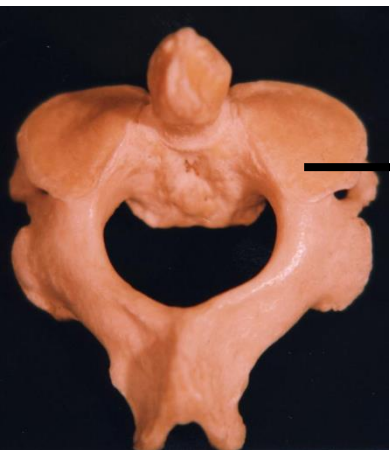
Sacrum (1)

Coccyx (1)

Toplam: 26



Atlas



Axis

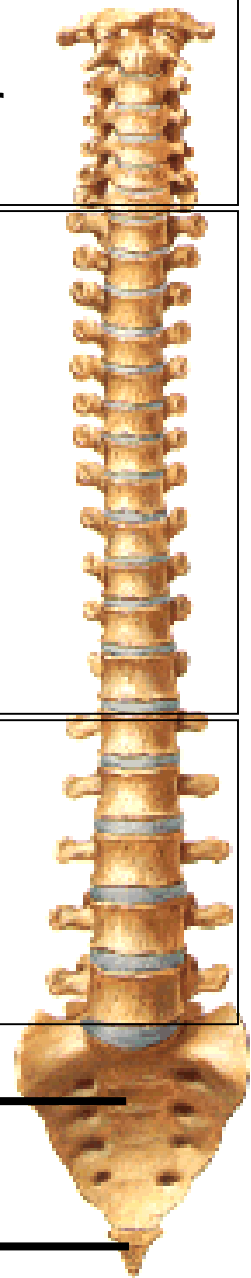
Servikal vertebralar

Torakal vertebralar

Lumbal vertebralar

Sacrum

Coccyx



Thorax

Sternum (1)

Costae (24)

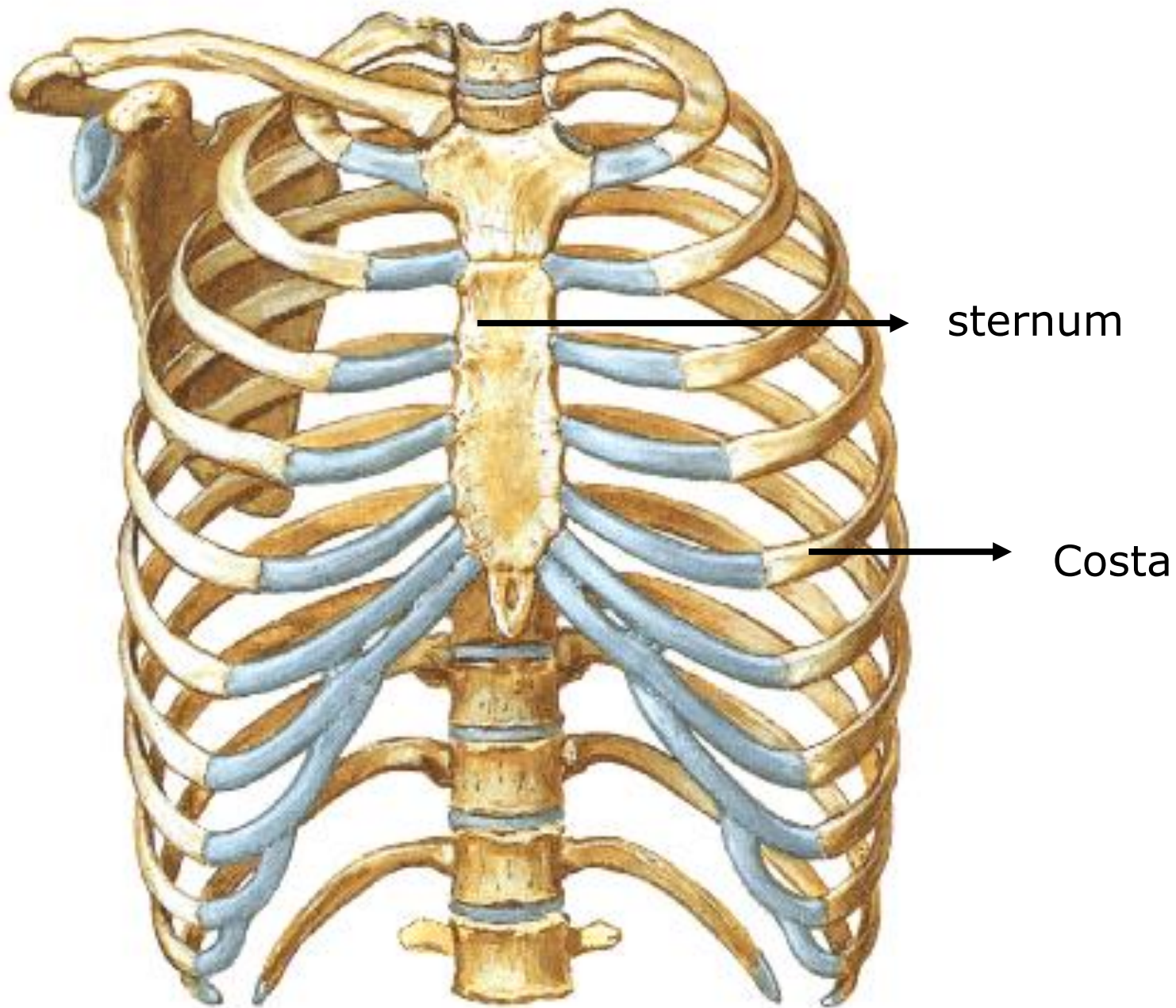
Costa vera

Costa spruria

Costa fluctuantes



Toplam: 25



Üst taraf (extremite) kemikleri

Cingulum pectorale

Os clavicae (2)

Os scapulae (2)

Pars libera membri superioris

Os humeri (2)

Os radii (2)

Os ulnae (2)

Ossa carpi

Os scaphoideum (2)

Os lunatum (2)

Os triquetrum (2)

Os pisiforme (2)

Os trapezium (2)

Os trapezoideum (2)

Os capitatum (2)

Os hamatum (2)

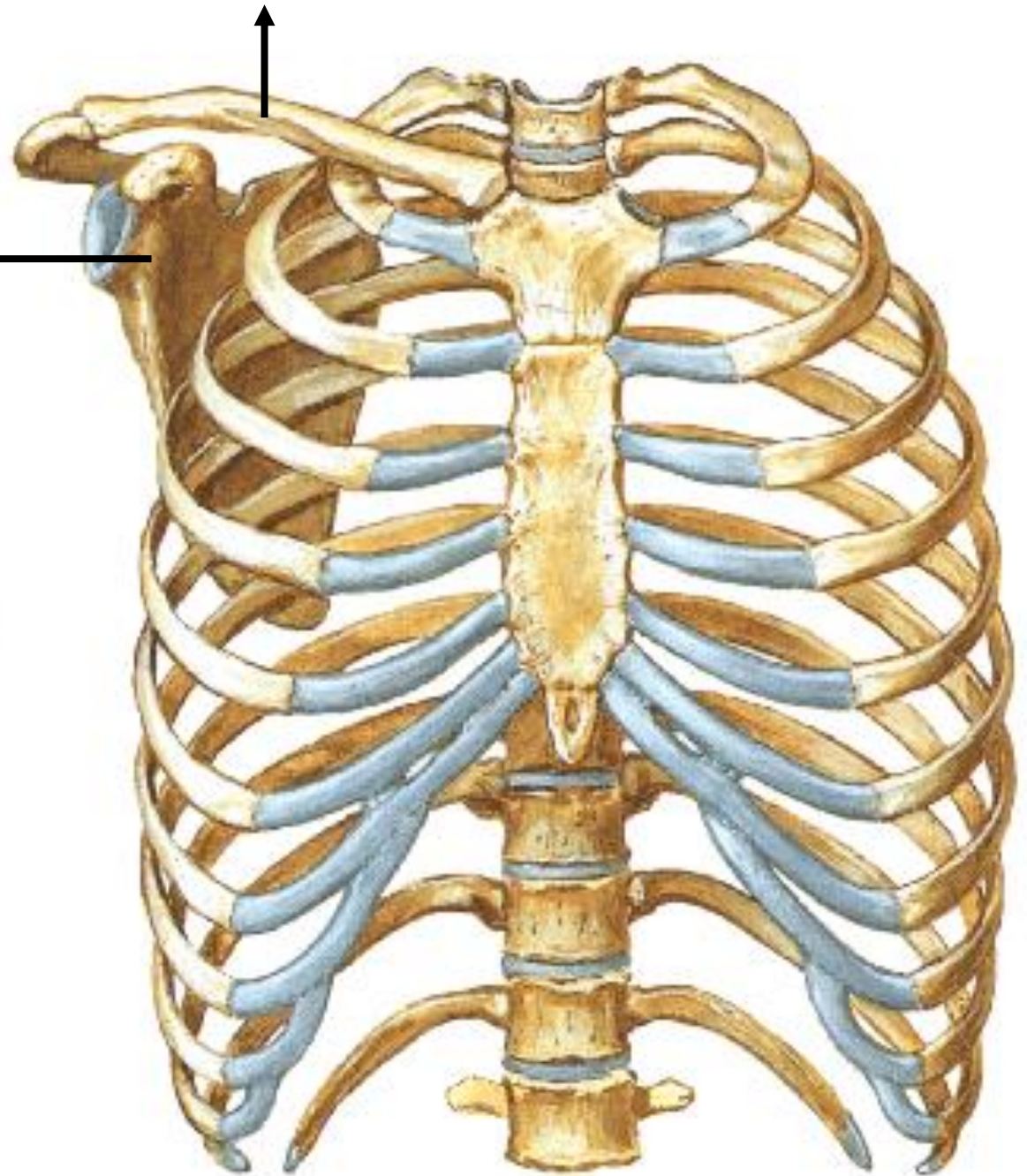
Ossa metacarpi (10)

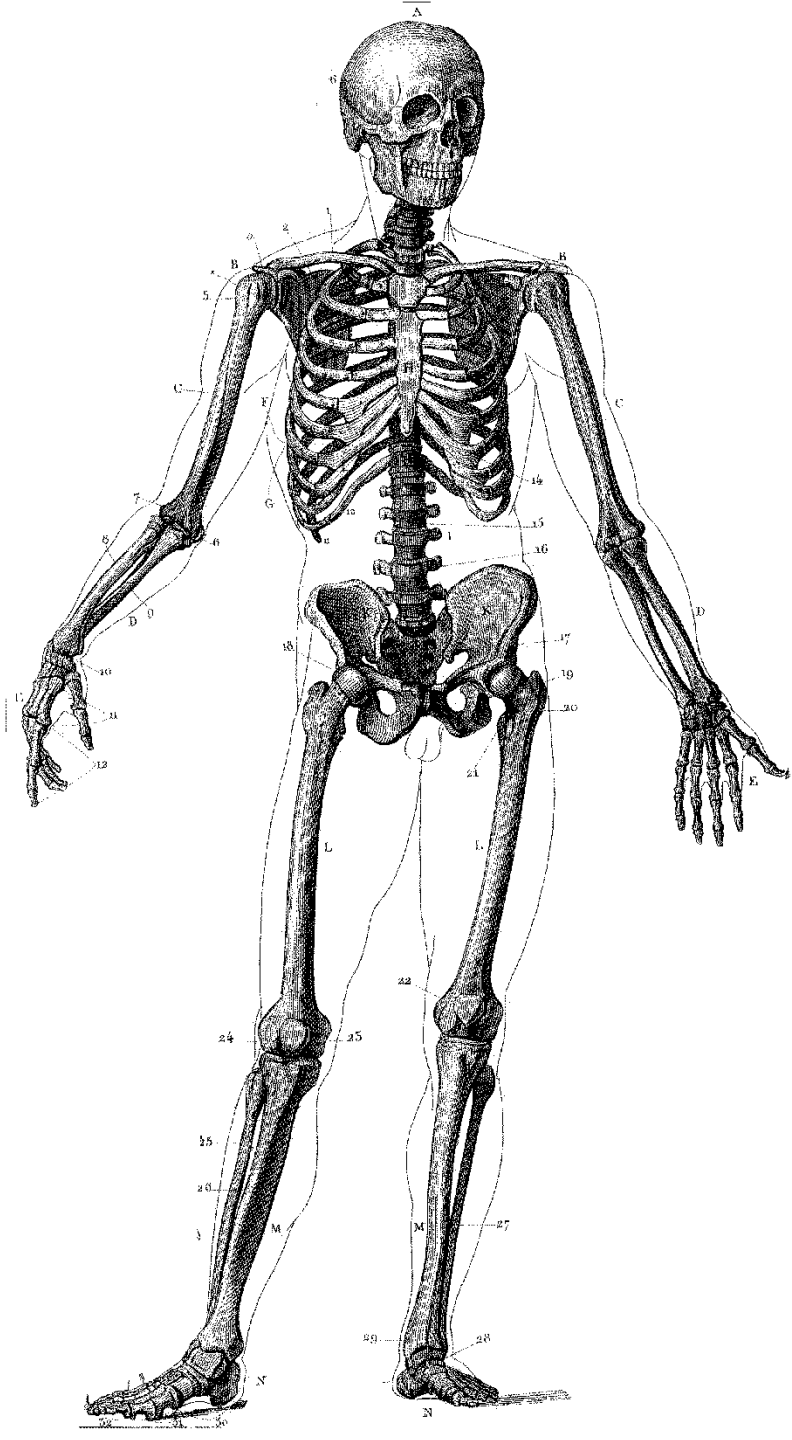
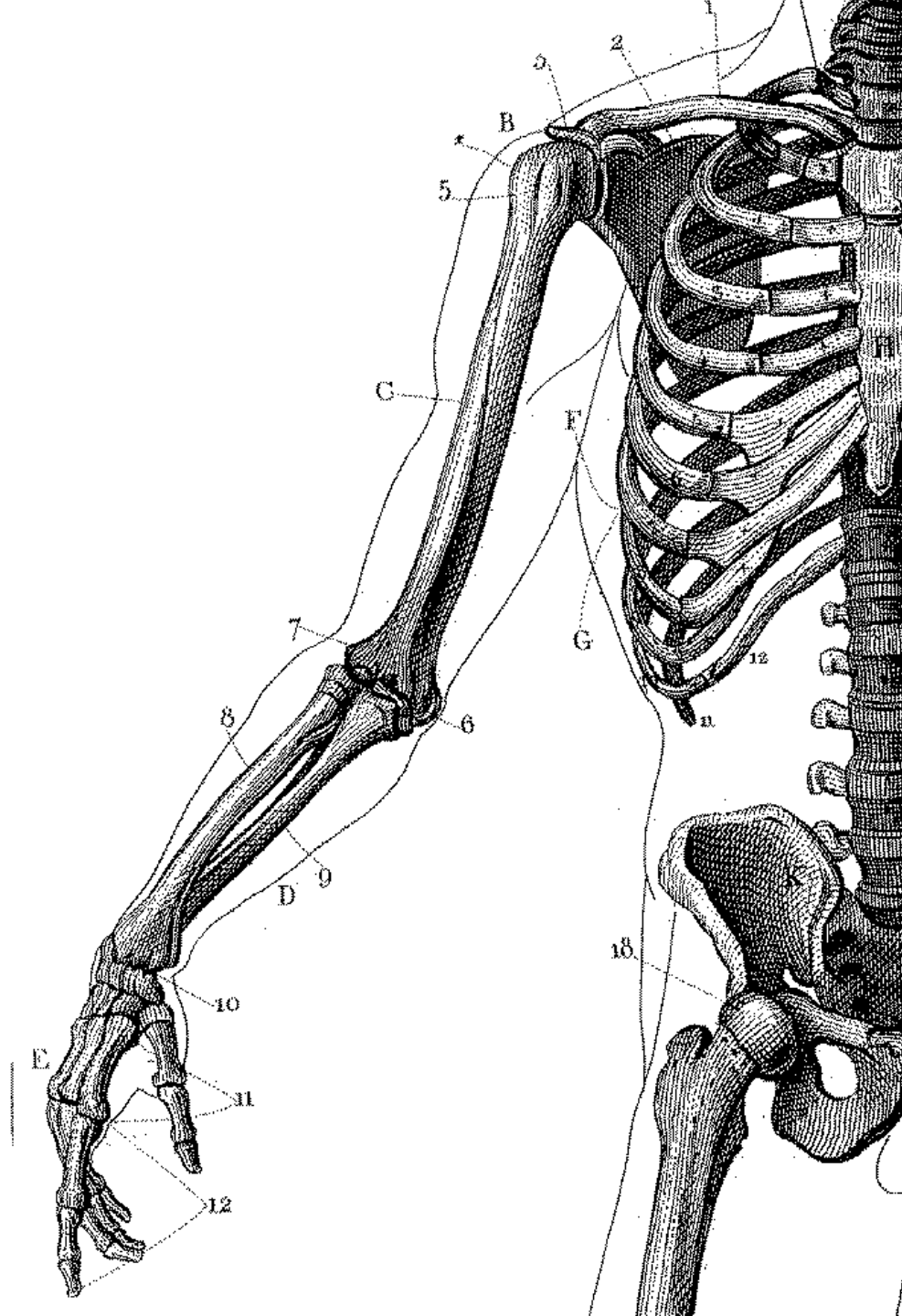
Phalanges (28)

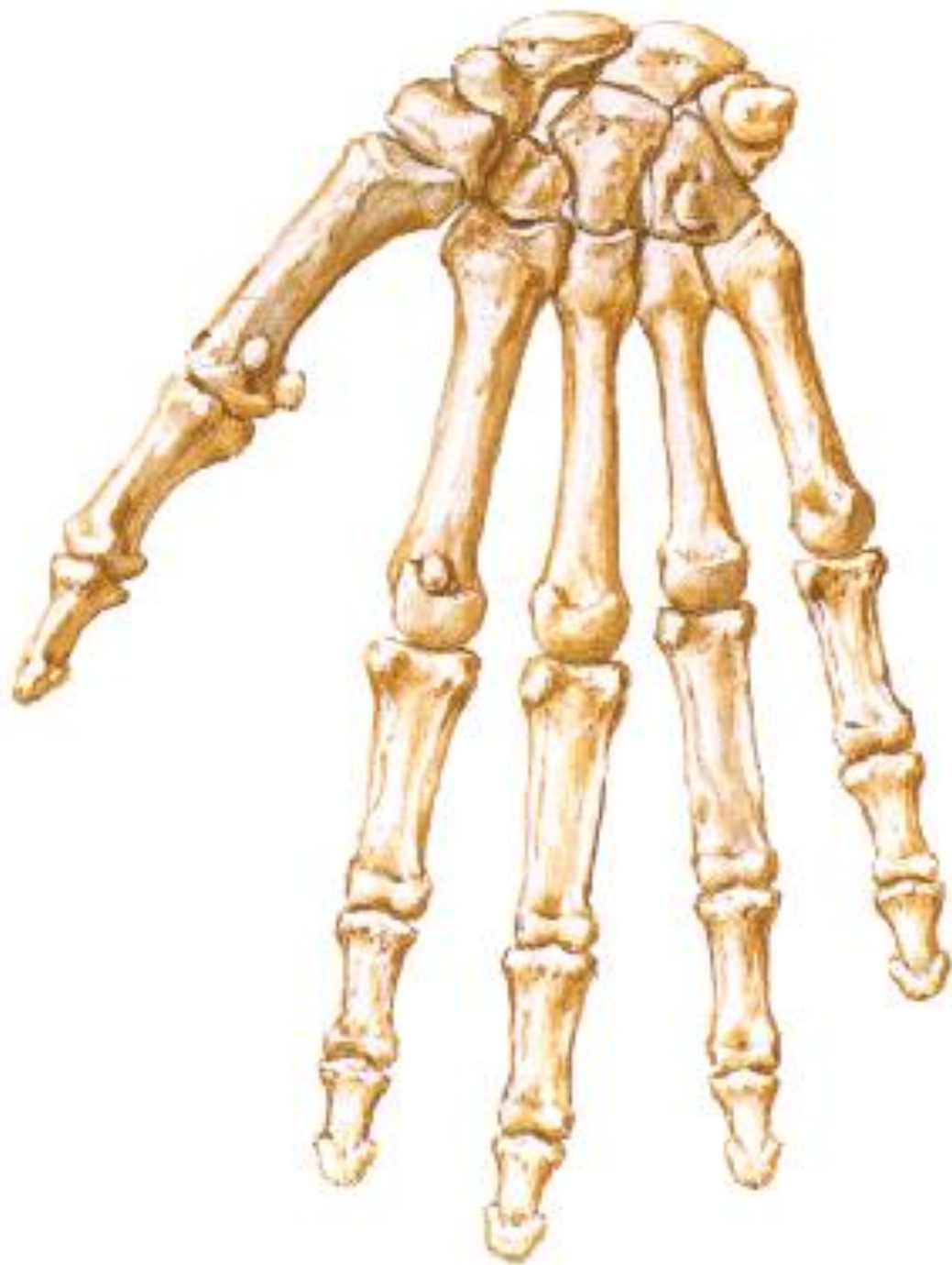
Toplam: 64

Clavicula

Scapula







Alt taraf (extremite) kemikleri

Cingulum pelvicum

Os coxae (2)

Pars libera membri inferioris

Os femoris (2)

Os patellae (2)

Os tibiae (2)

Os fibulae (2)

Ossa tarsi

Os tali (2)

Os calcanei (2)

Os naviculare (2)

Os cuboideum (2)

Os cuneiforme mediale (2)

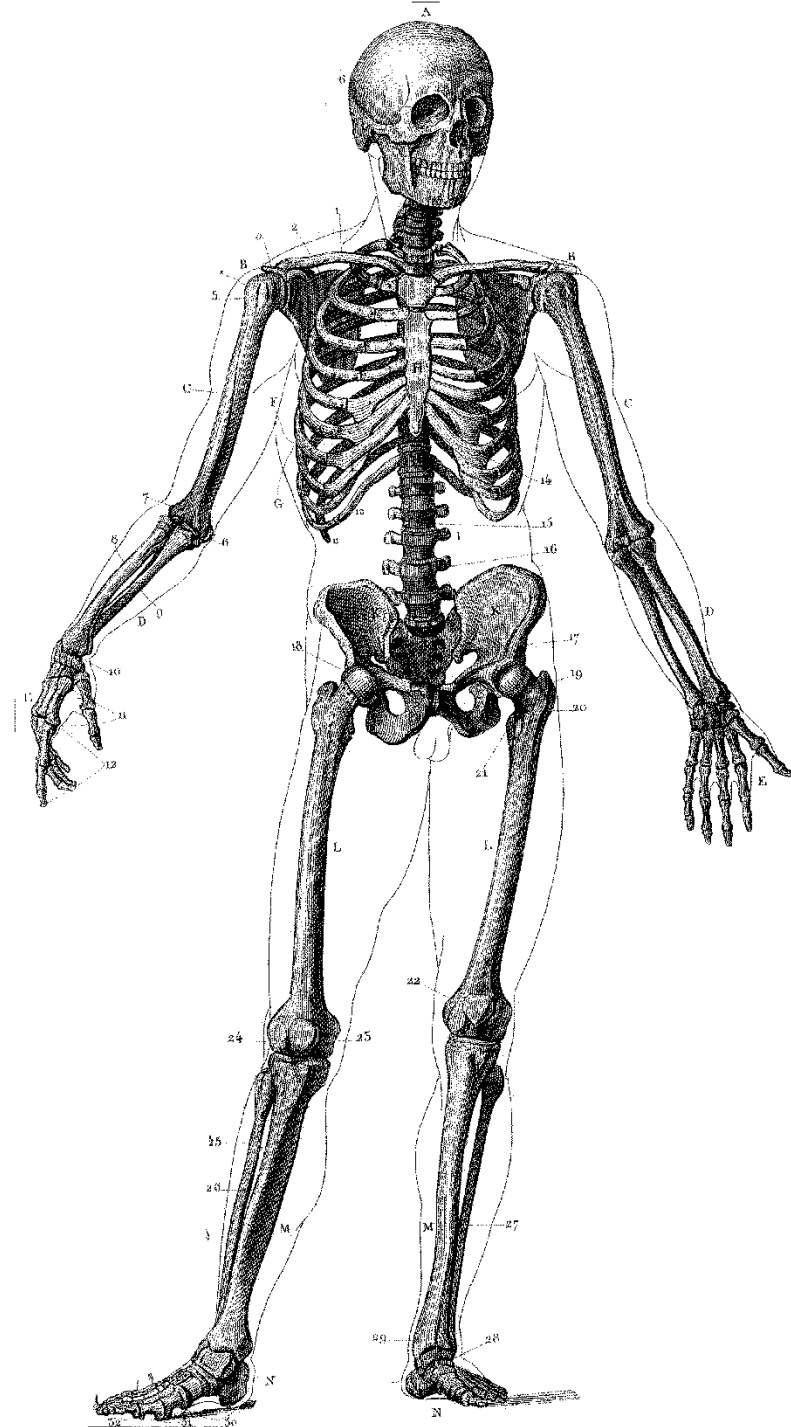
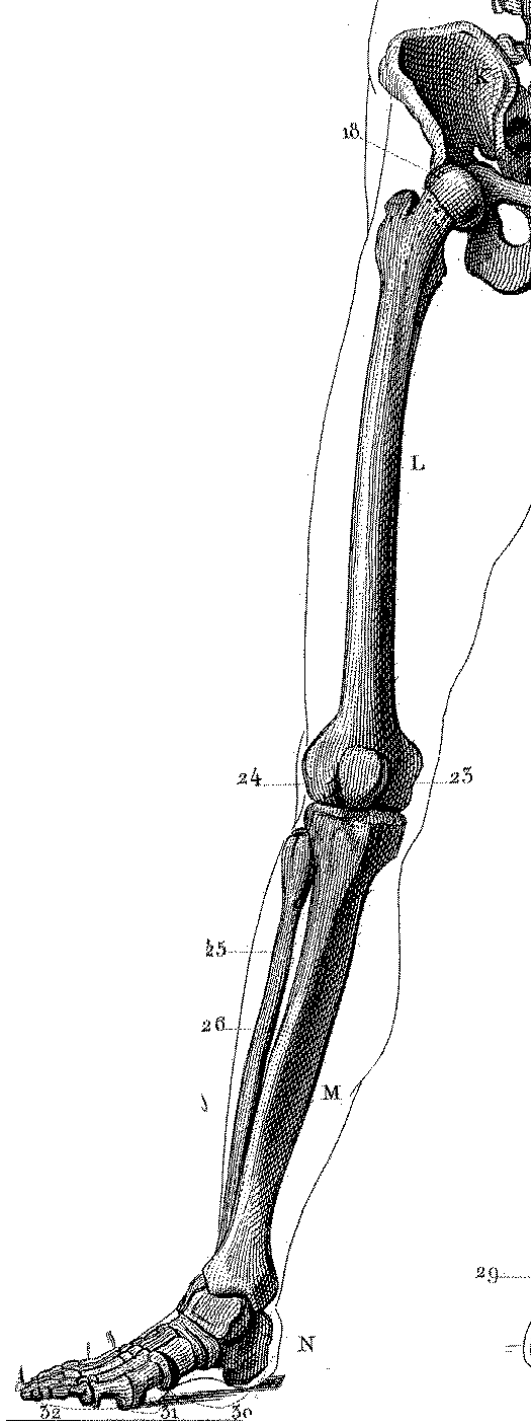
Os cuneiforme intermediale (2)

Os cuneiforme laterale (2)

Ossa metatarsi (10)

Phalanges (28)

Toplam: 62





Skeleton axiale

Neurocranium (20)

Visserocranium (8)

Os hyoideum (1)

Columna vertebralis (26)

Skeleton thoracis (25)

Toplam: 80

Toplam: 206

Skeleton appendiculare

Membrum superius (64)

membrum inferius (62)

Toplam: 126

Çocuk

270 kemik

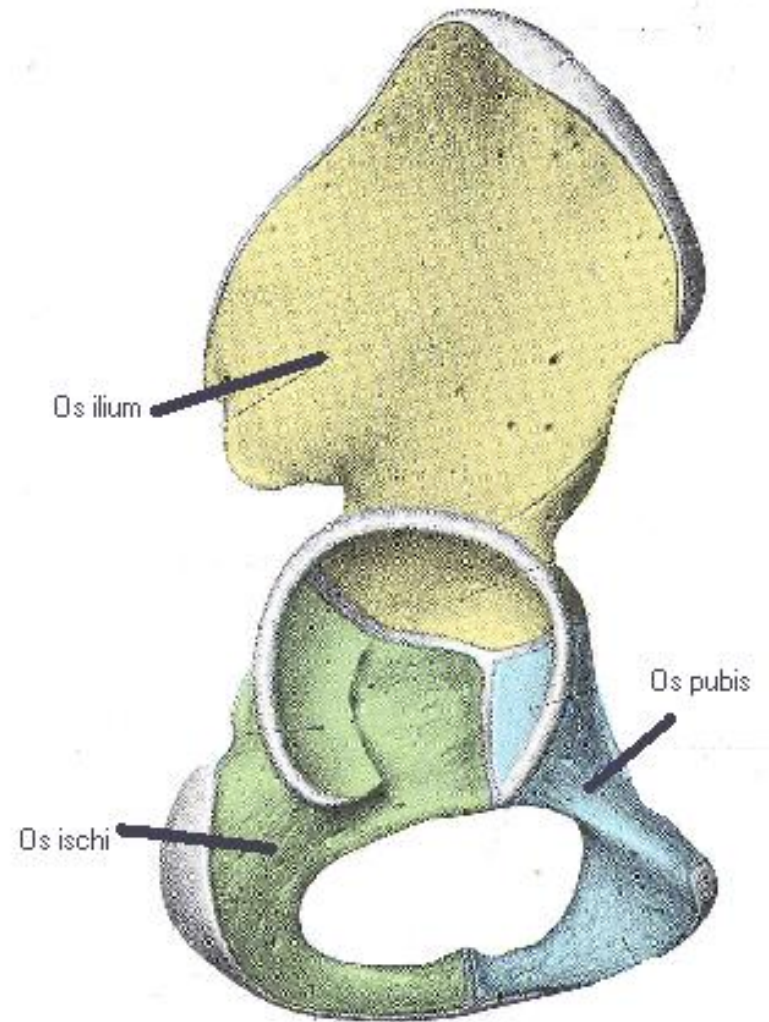
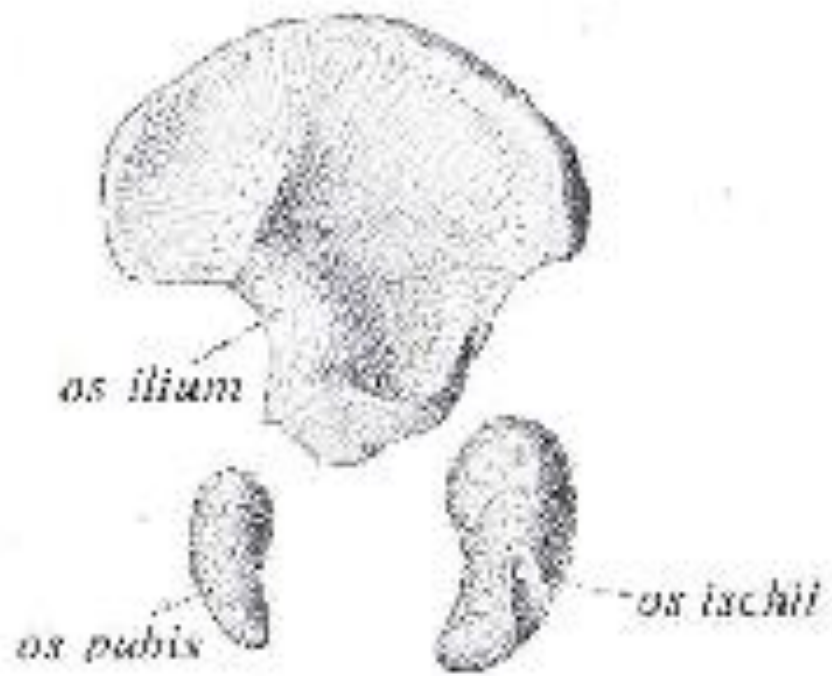
14 yaş

256 kemik

Tam şekillenip birbiriyle kaynaştıktan sonra

Erişkin

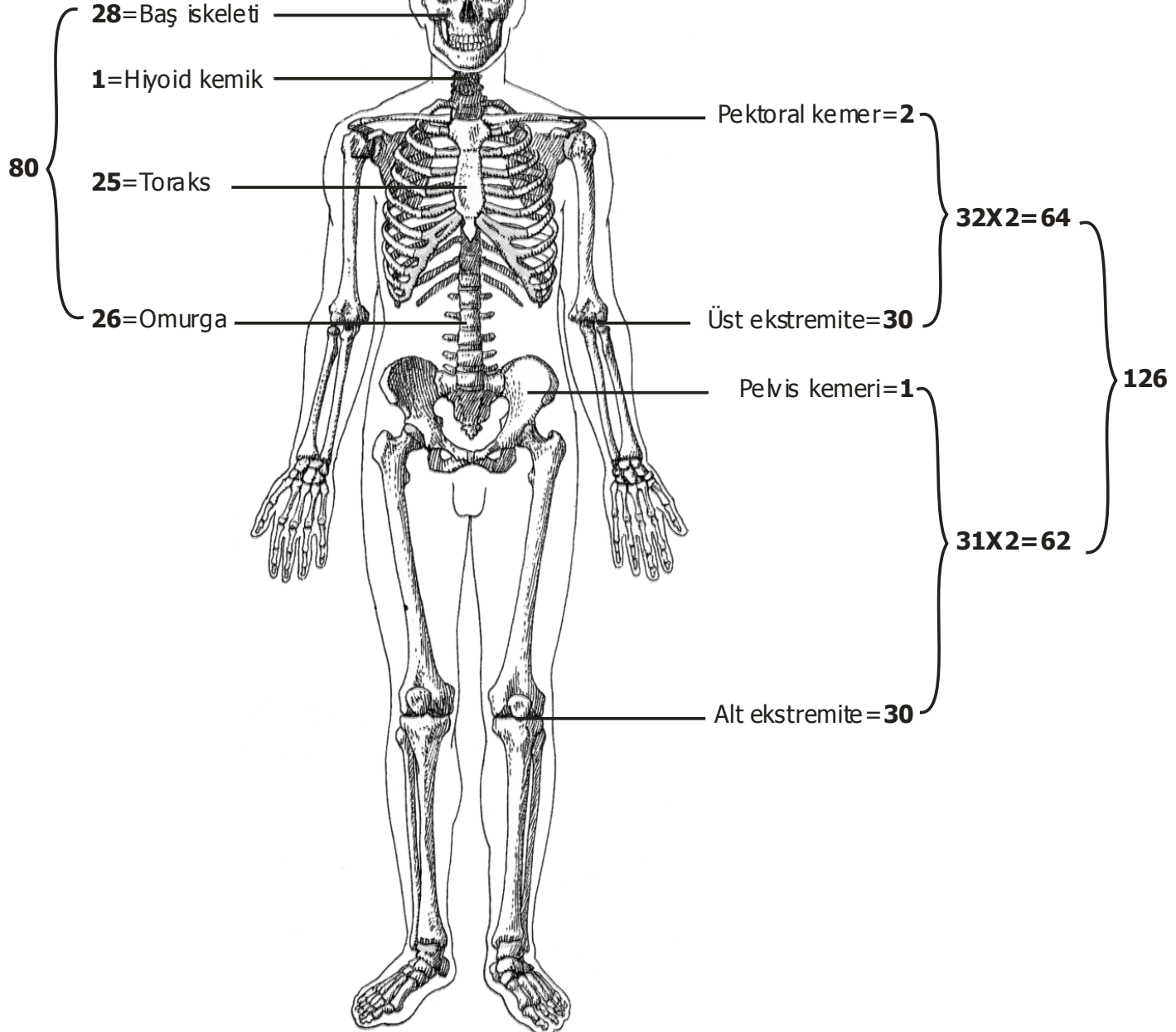
206 kemik



206

Aksiyel iskelet

Appendiküler iskelet



Kemiğin içeriği

% 60-70 (2/3) inorganik maddeler (sertlik sağlar)

%85 Kalsiyum fosfat

%10 Kalsiyum karbonat

%1.5 Magnezyum fosfat

Bazı alkali tuzlar (Kalsiyum florit, kalsiyum klorit)

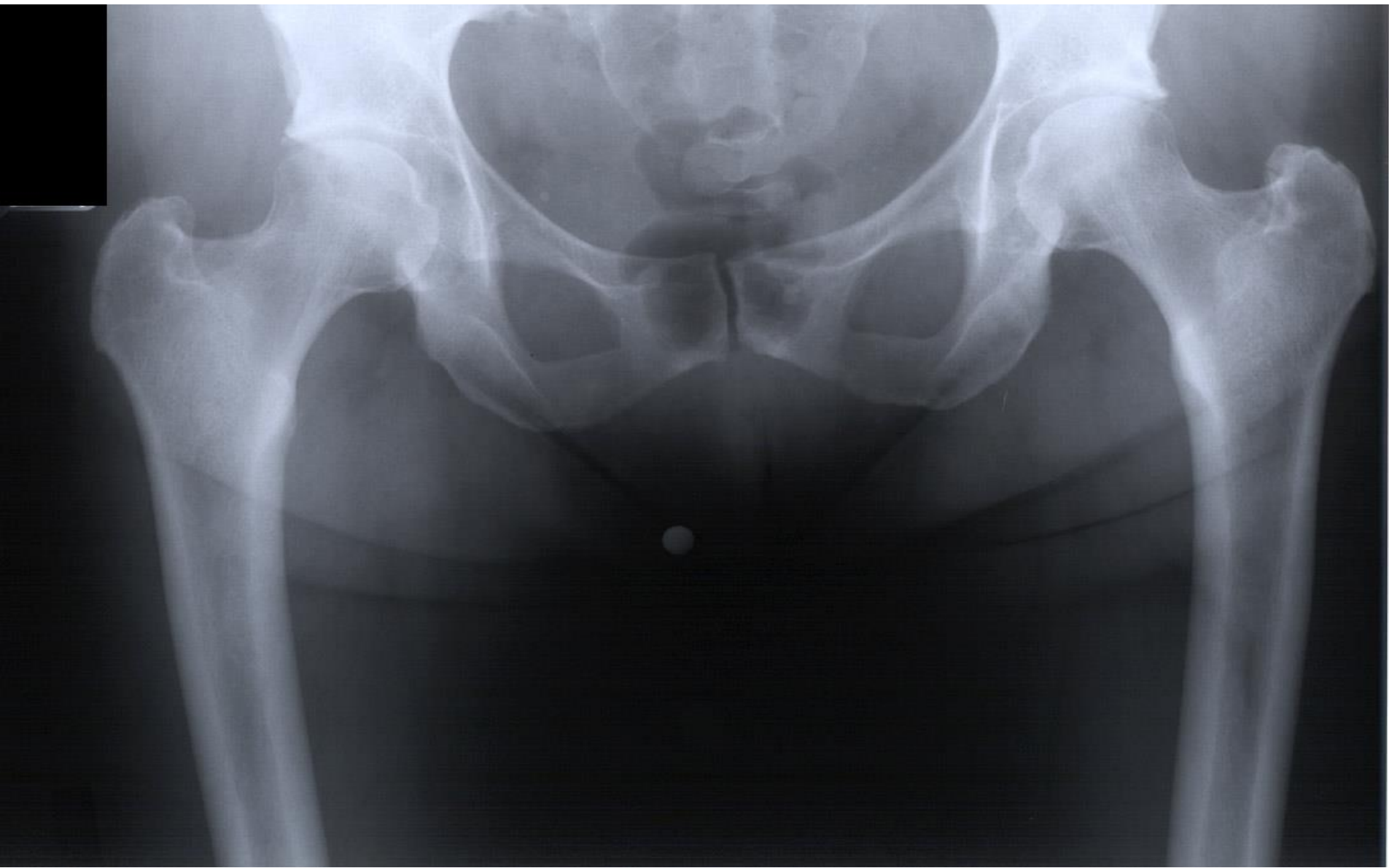
% 30-40 (1/3) organik maddeler (elastikiyet sağlar)

%95 kollagen lif.

Yoğun dokular radyografilerde radyoopak
az yoğun doku radyolusent görülür

Kemik dokusu içindeki kalsiyum tuzlarının kristalleşme derecesi
kemiğin röntgen ışınlarını az geçirmesine yol açar. Böylece
radyoopak görünüm verir.





Kemiklerin eklem yüzleri dışında kalan kısımları periosteum denilen zar ile sarılıdır.

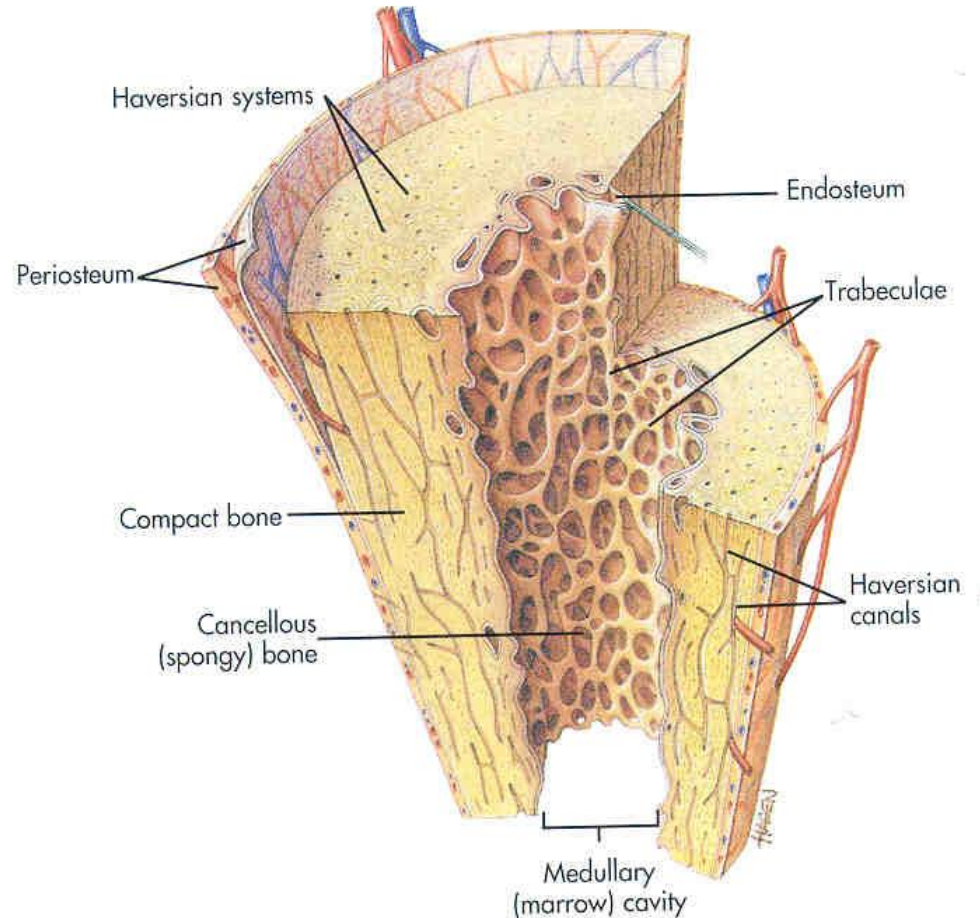
- Kemiğin beslenmesi ve yenilenmesini sağlar.
- Kemikleri birbirine bağlar.
- Kiriş ve kasların kemiğe tutunmalarını sağlar.
- Sinir liflerince çok zengindir. Bu nedenle ağrıya duyarlıdır.
- Periosteum hasarı kemik ölümüne yol açar.

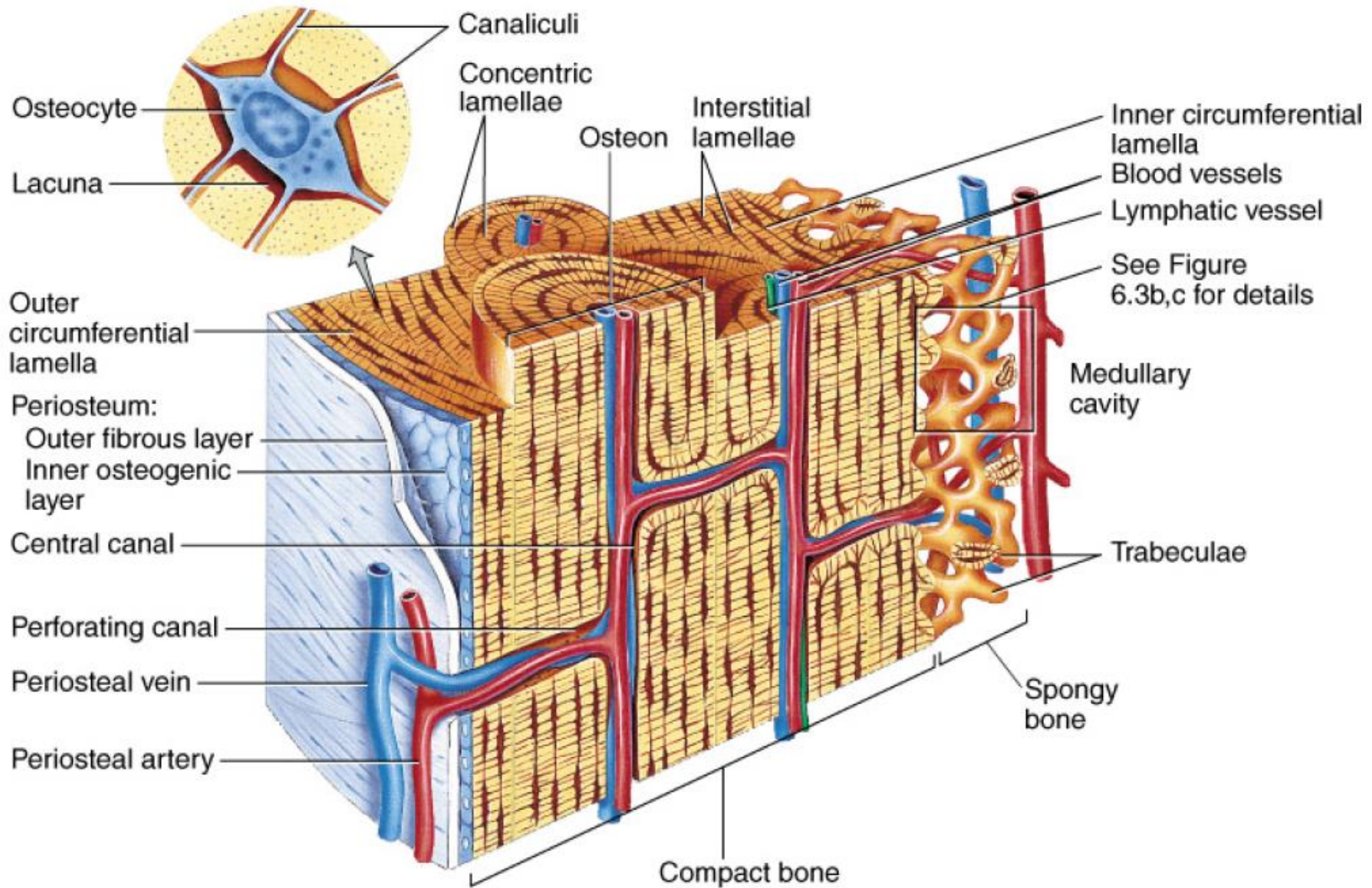
Periosteum'un iki tabakası vardır.

Stratum fibrosum (Eklem kapsülünün fibröz tabakası ile devam eder)

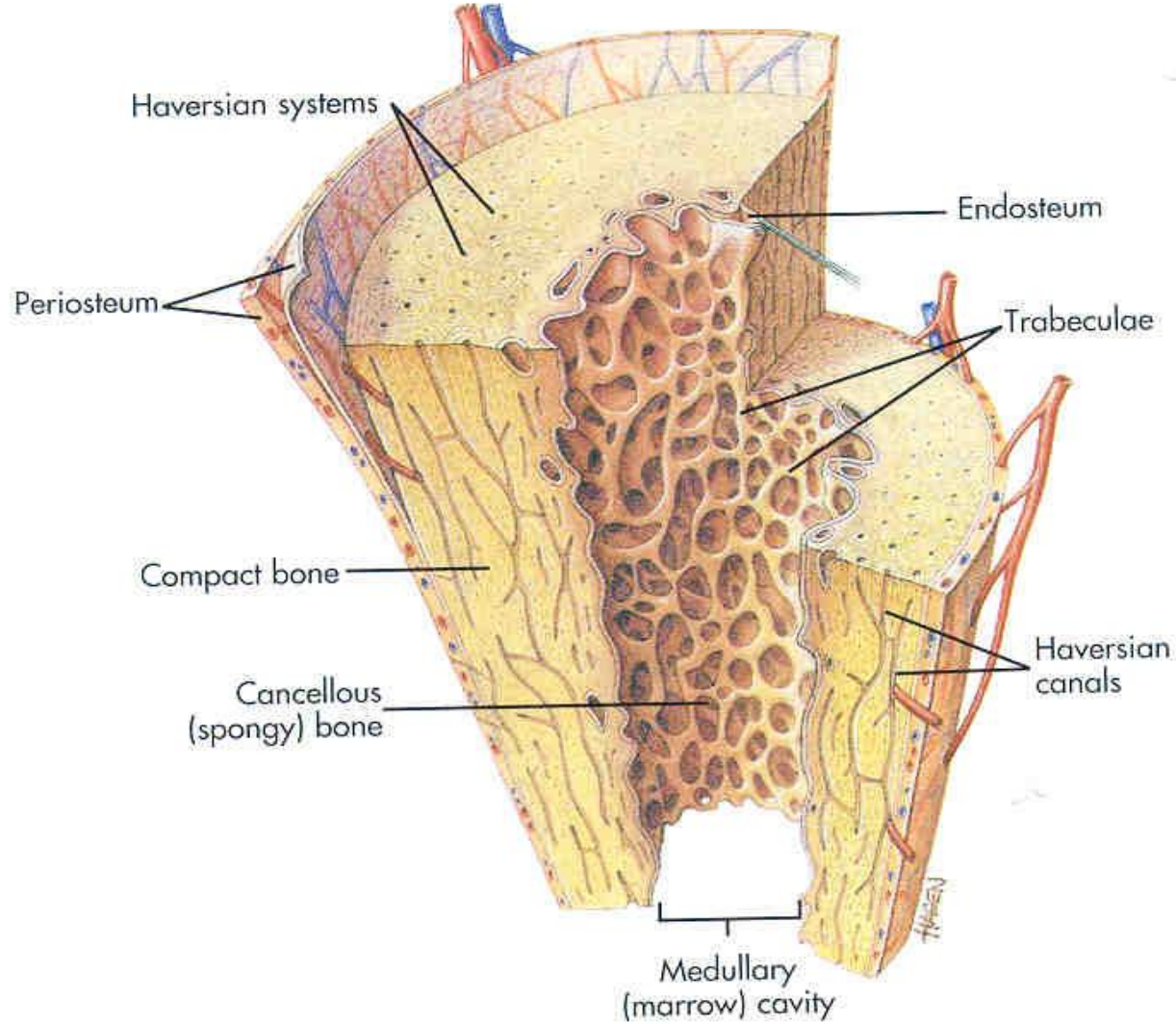
Stratum osteogenicum (Damardan zengin ve kemikte enine büyümenin olduğu yerdir.)

Periosteum'un hasarı
kemiğin ölümüne neden
olur





Kemiğin iç boşluklarının duvarları endosteum ile örtülüdür



Kemikler iki kısımdan oluşur

Kompakt doku (Substantia compacta)

Spongioz doku (Substantia spongiosa)



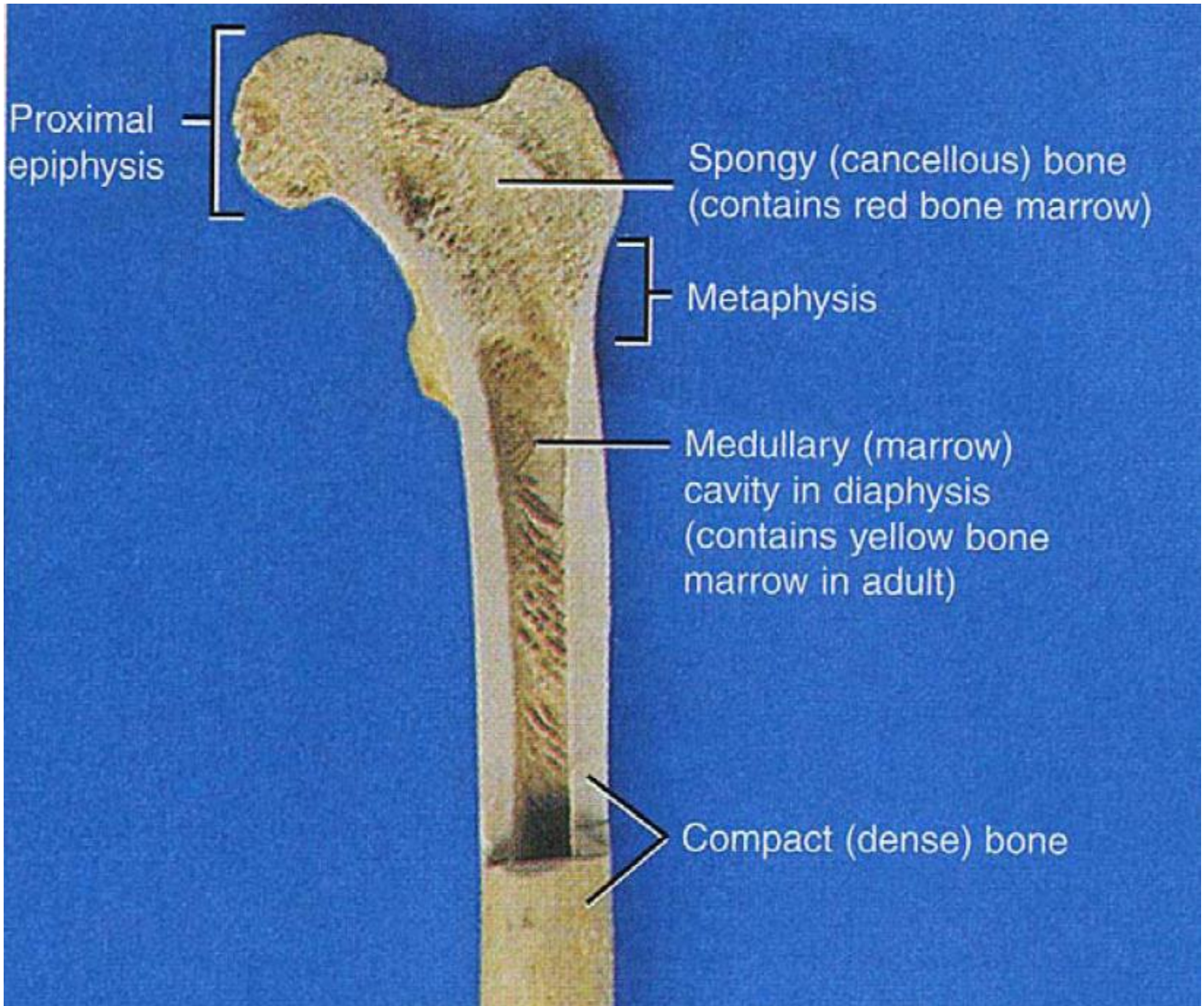
Proximal
epiphysis

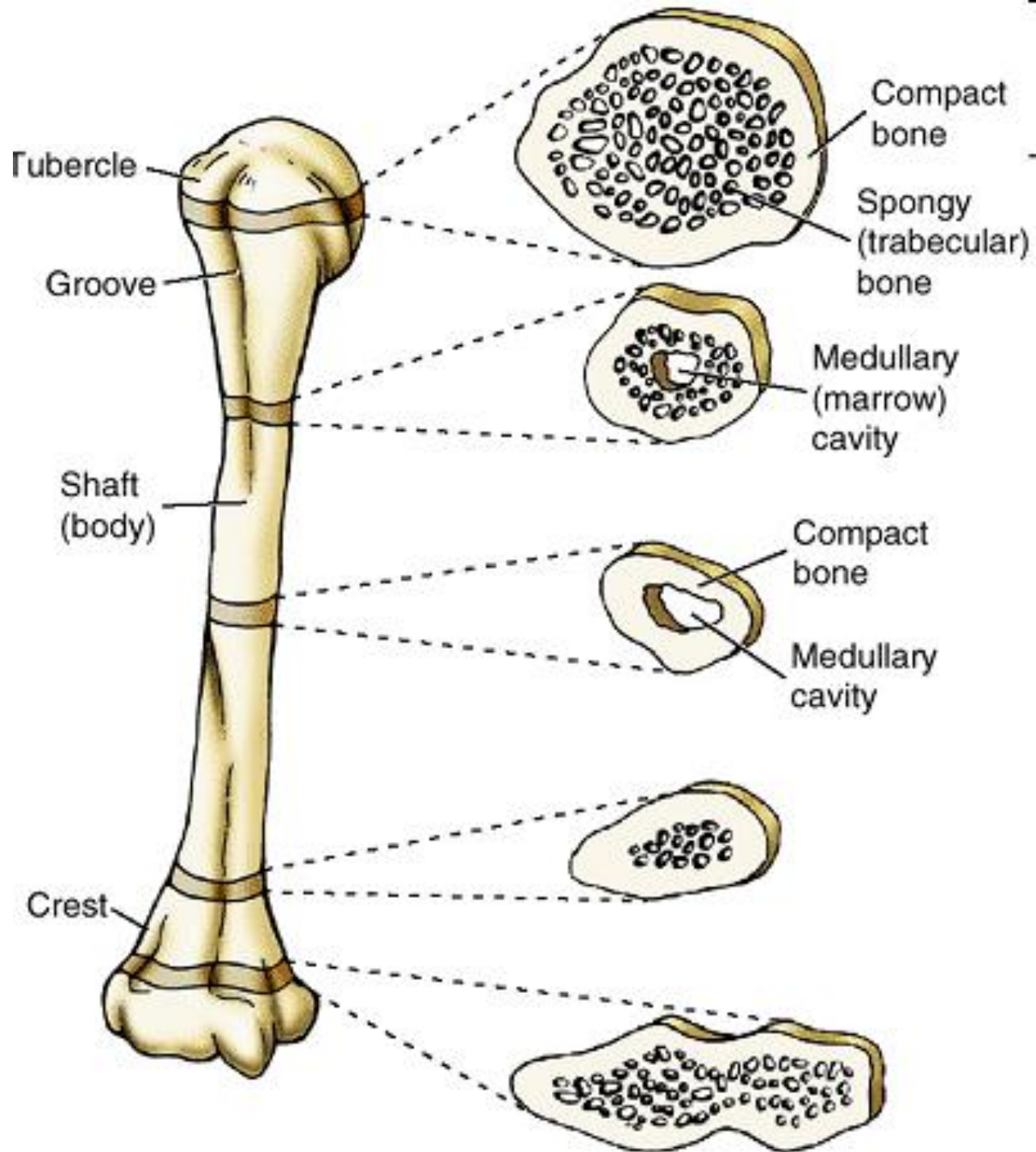
Spongy (cancellous) bone
(contains red bone marrow)

Metaphysis

Medullary (marrow)
cavity in diaphysis
(contains yellow bone
marrow in adult)

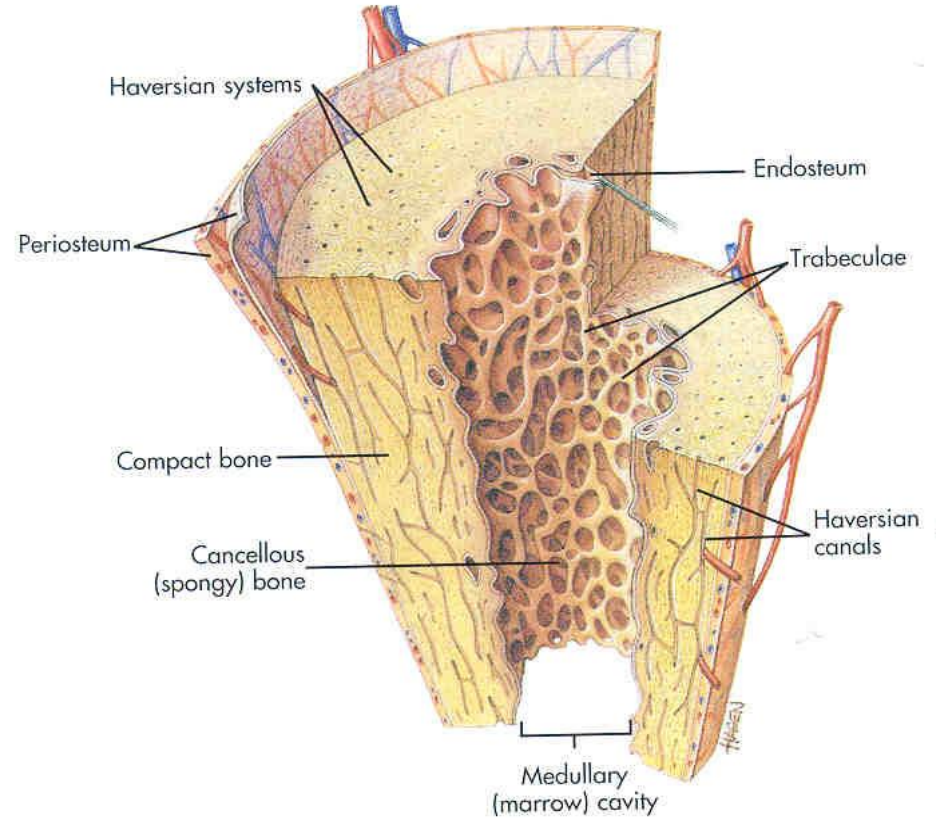
Compact (dense) bone





Kompakt doku (Substantia compacta)

Kemiklerin dış kısmını oluşturan İçerisinde havers kanalları denilen ince kanalcıklar vardır. Bu kanallarda kemik dokusunun kılcal damarları bulunur.



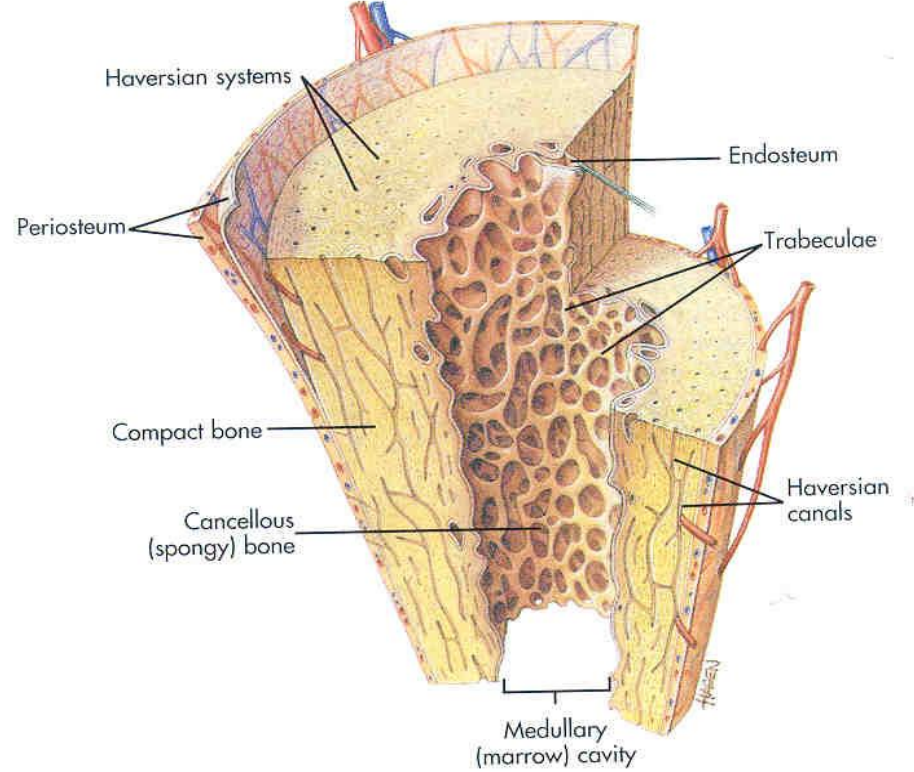
Spongioz doku (Substantia spongiosa)

Bu tabakada kemik matriks'inde basınç ve gerilmeye göre düzenlenmiş trabeculalar bulunur.

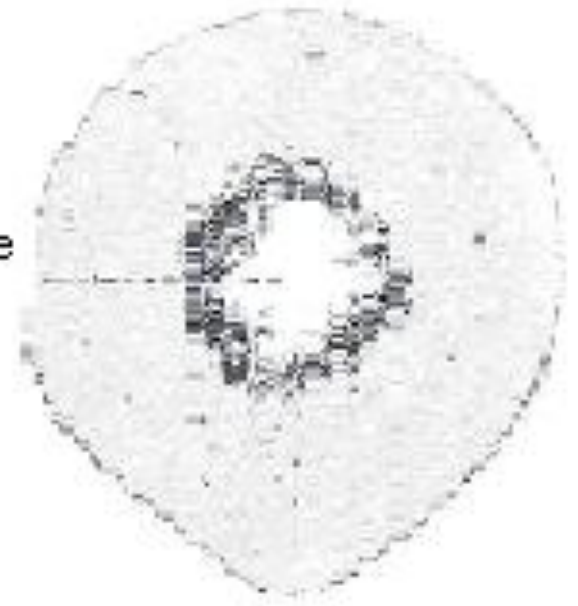
Uzun ve yassı kemikler içerisinde trabeculalar arasında bulunan boşluğa **Cavitas medullaris** denir.

Bu boşlukta

Medulla ossium (Kemik iliği) bulunur.



Cavum medullare



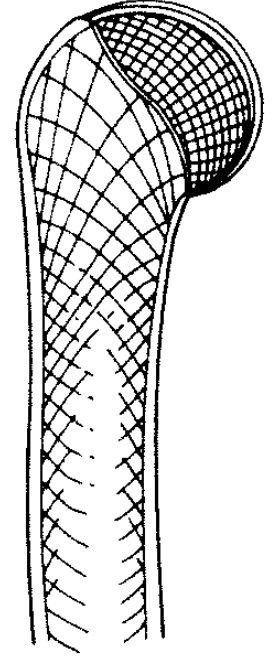
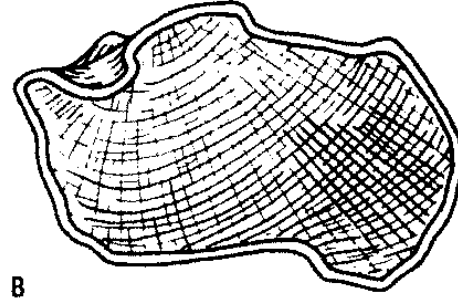
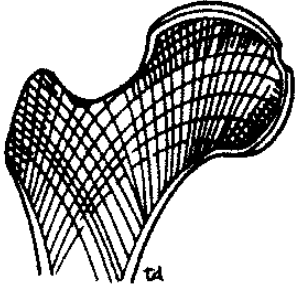
Medulla ossium gençlerde
kan yapıcı elemanları
içerir. Kırmızı renktedir.

(Medulla ossium rubra),

Yaşlılarda sarı renktedir.

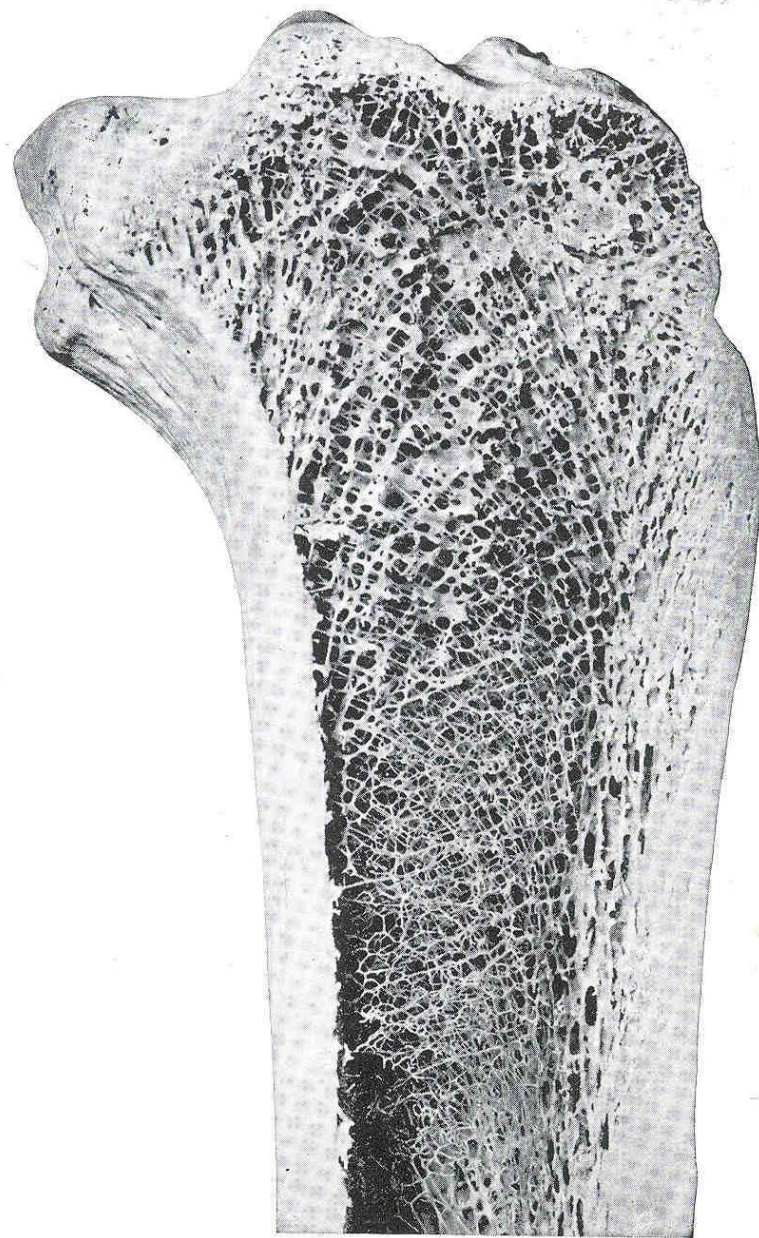
(Medulla ossium flava)

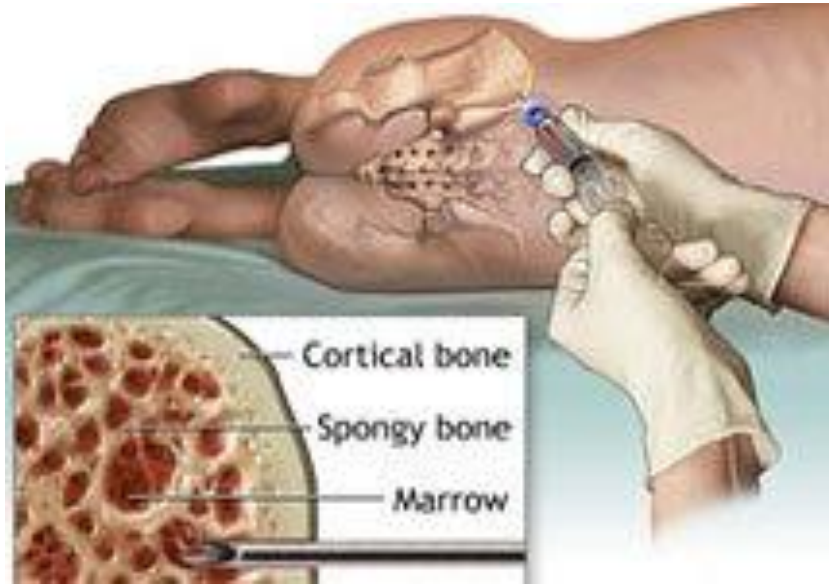
Yaşlılarda da **Sternum, ilium ve vertebra** gibi kemiklerde medulla ossium rubra bulunur.



Trajector: Kemik kesitlerinde spongioz dokudaki mekanik etkilerin yönünü gösteren çizgilerdir.

Kasların çekme kuvveti ve yer çekimi tarafından oluşturulur

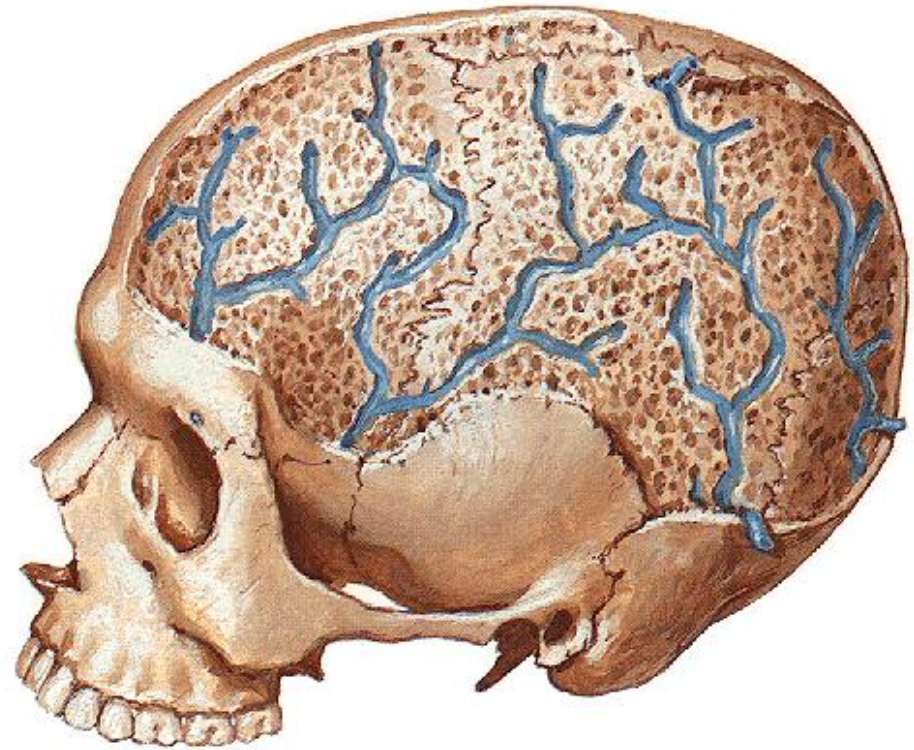
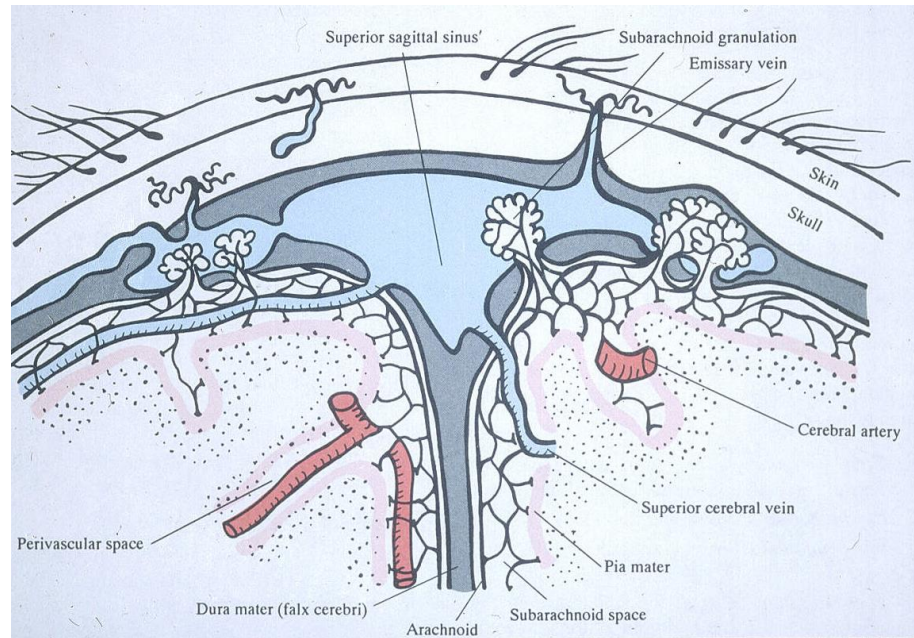


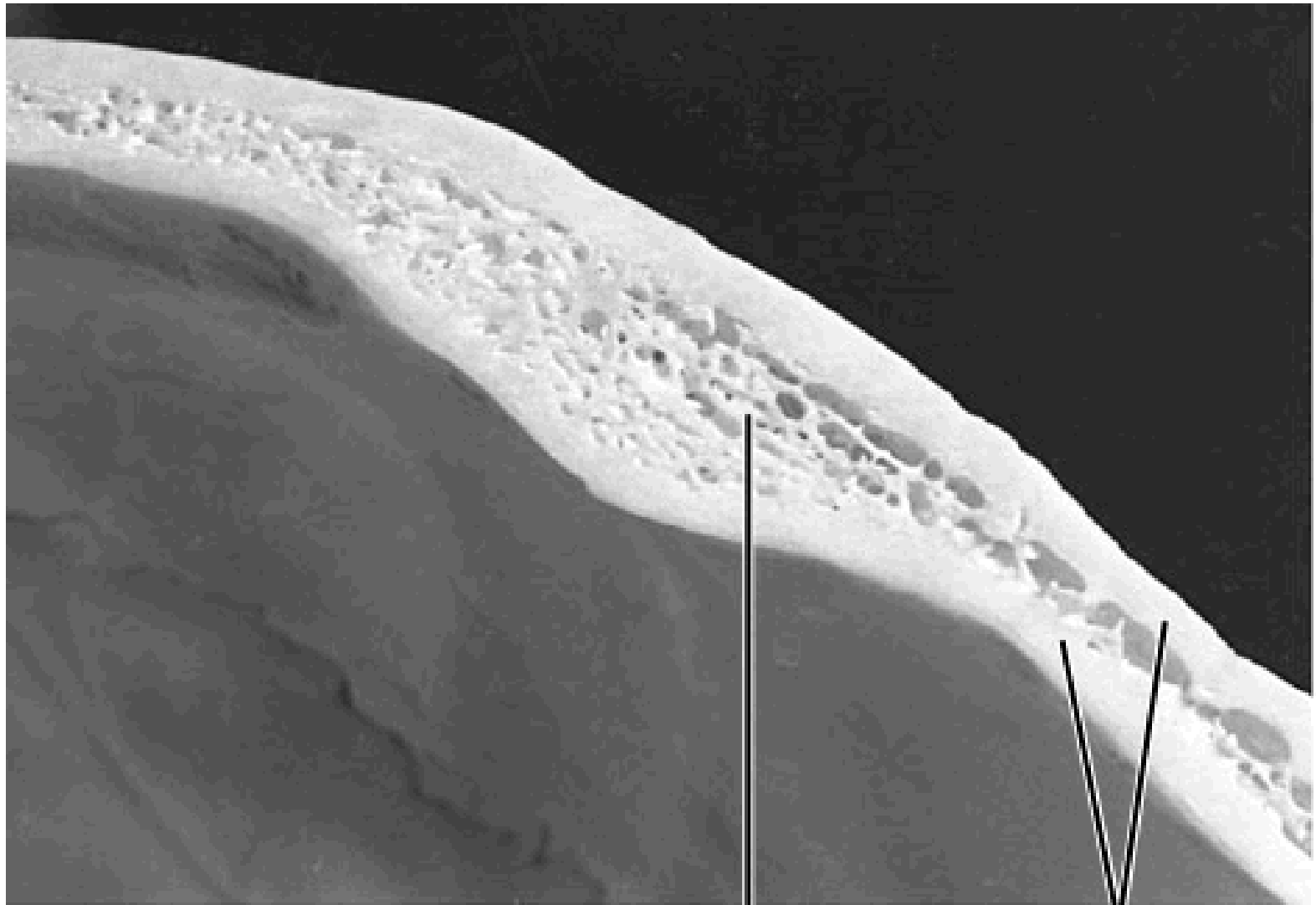


Kemik iliği aspirasyonu



diploe





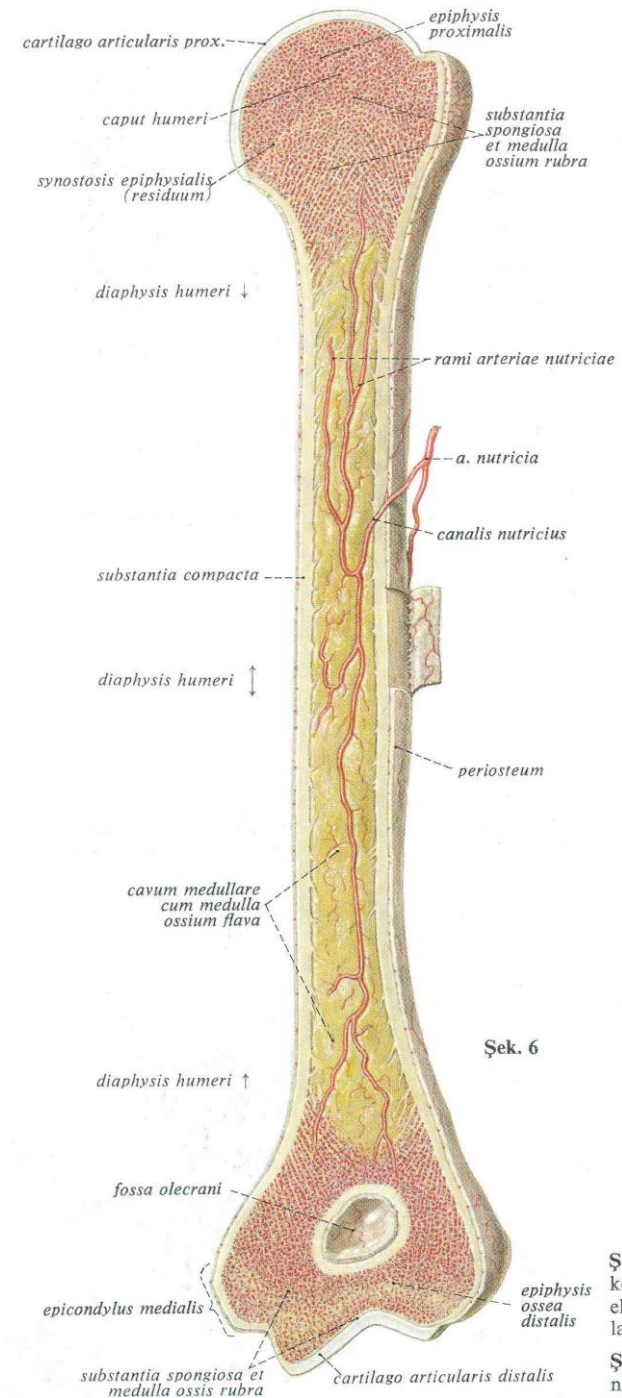
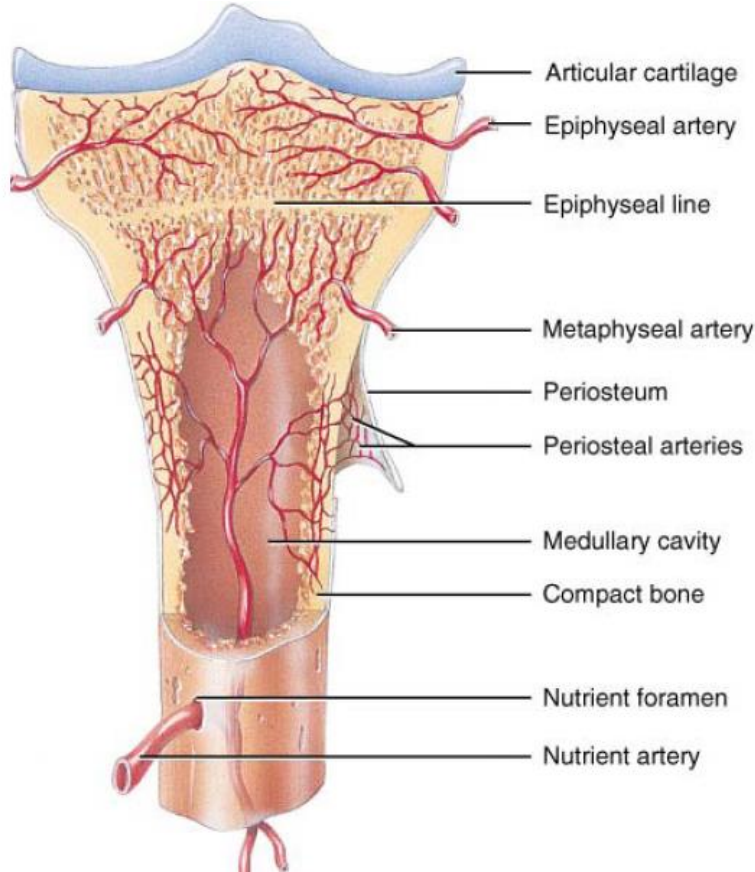
Spongy bone Compact bone

Kemiğin Beslenmesi;

Foramen nutricium

Canalis nutricius

(vasa nutricia + sinirler)



Kemikleşme (Ossifikasyon)

1- İntramembranöz kemikleşme

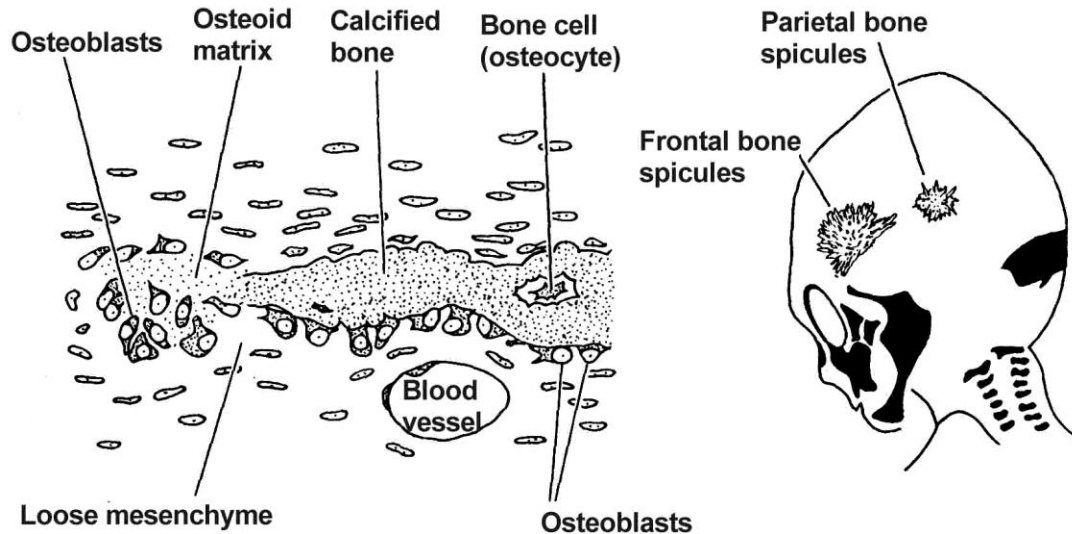
2-İntrakartilaginöz kemikleşme

a- Enkondral kemikleşme

b- Perikondral kemikleşme

1- İntramembranöz kemikleşme

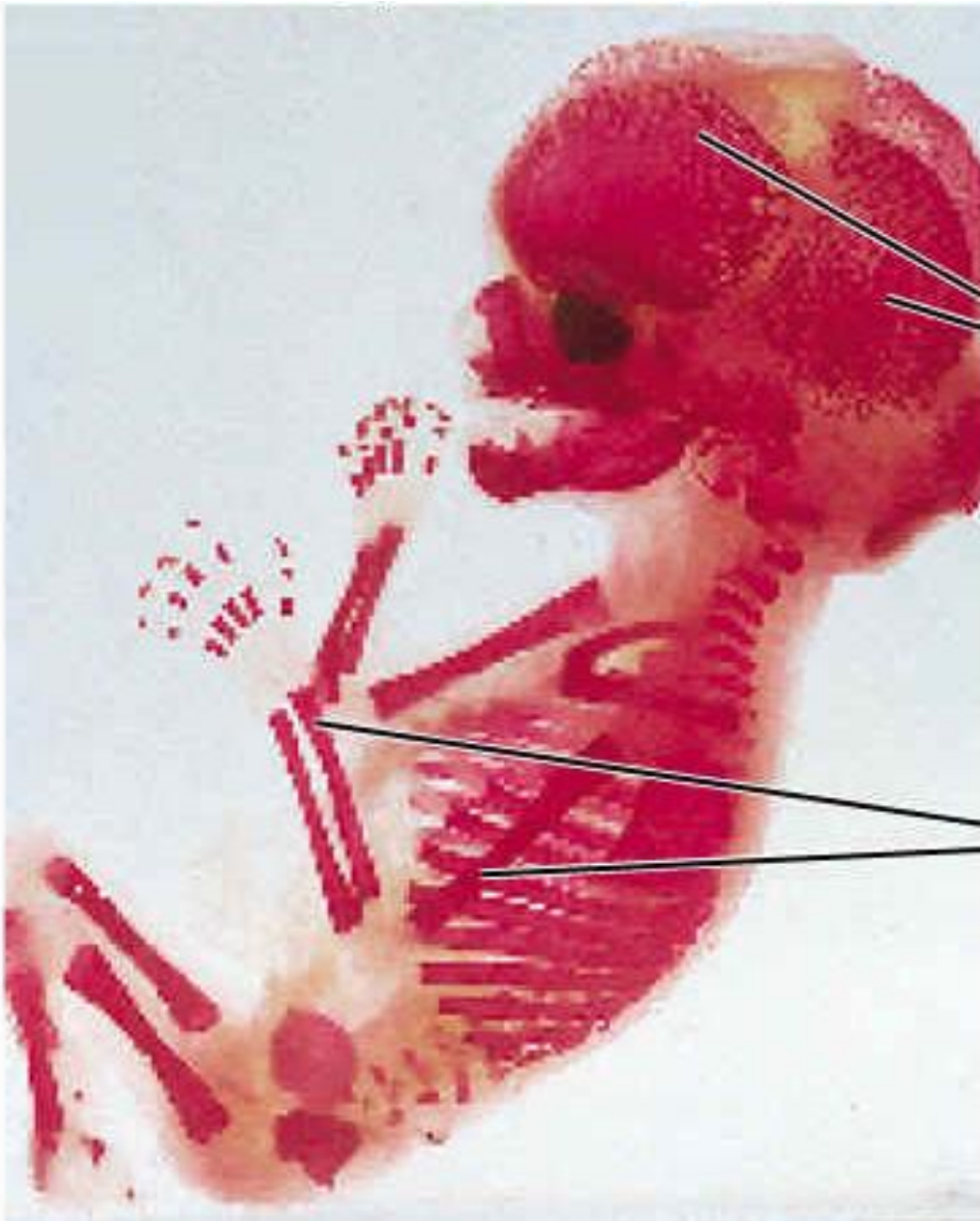
- Primer, **desmal** ve bağ dokusu kaynaklı kemikleşme olarak da bilinir
- Embriyonel mezenşimal bağ dokusunun kemikleşmesi söz konusudur
- Bağ dokusu hücreleri kıkırdak dokusu hücrelerine dönüşmeden osteoblastlarla yer değiştirir
- Yassı kafa kemikleri bu yolla kemikleşir



Fetus with Osteogenesis Imperfecta

Intramembranous
bones forming

Endochondral
bones forming



2- İntrakartilaginöz kemikleşme

- Sekonder, **chondral** ve kıkırdak dokusu kaynaklı kemikleşme olarak da bilinir
- Embriyonel mezenşimal bağ dokusunun önce kıkırdak dokusuna daha sonra da kemik dokusuna dönüşmesi söz konusudur
- Uzun ve kısa kemiklerde bu kemikleşme tipi gözlenir
- Alt tipi olan enkondral kemikleşmede, kemikleşme kemik tasalağının iç kısmından başlayarak dışa doğru yayılır
- Perikondral tipte ise kemikleşme kemik tasalağının dış kısmından başlayarak içe doğru yayılır

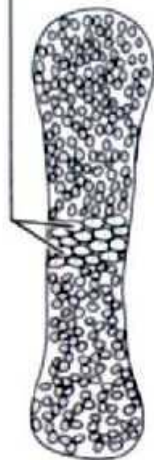
Mesenchyme



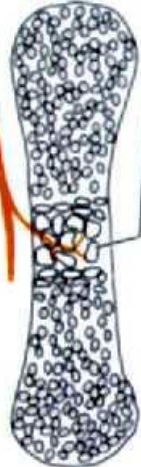
Cartilage



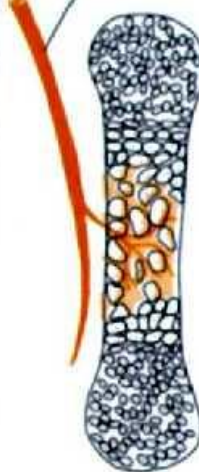
Hypertrophic chondrocytes



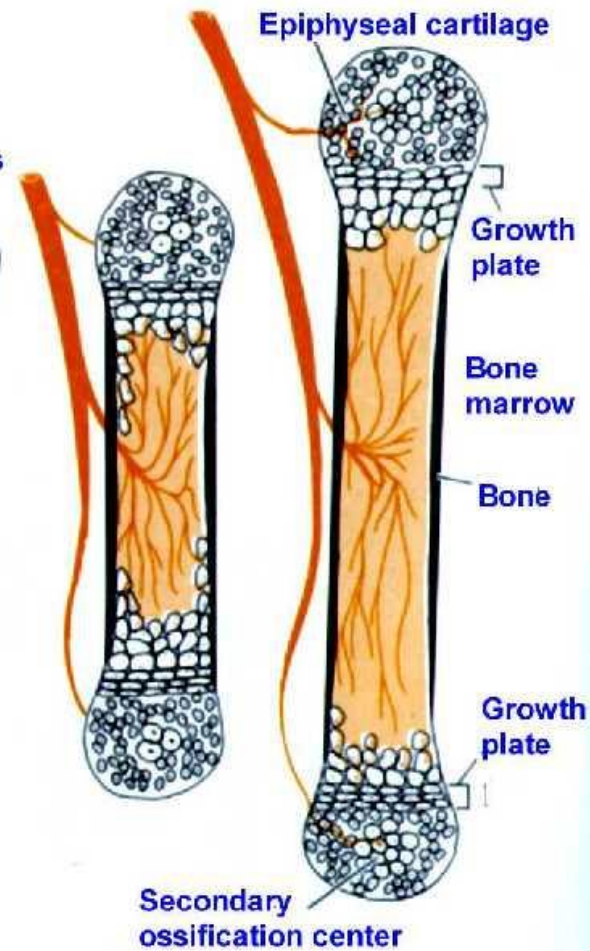
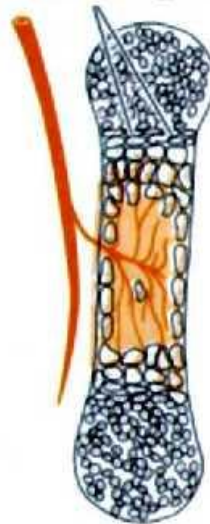
Osteoblasts (bone)

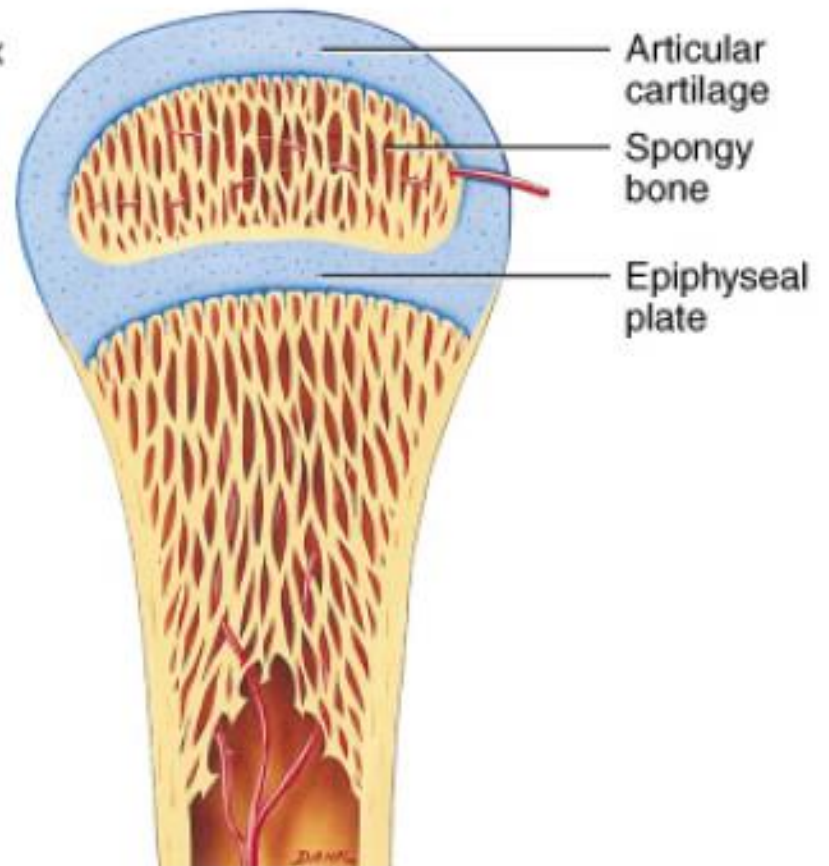
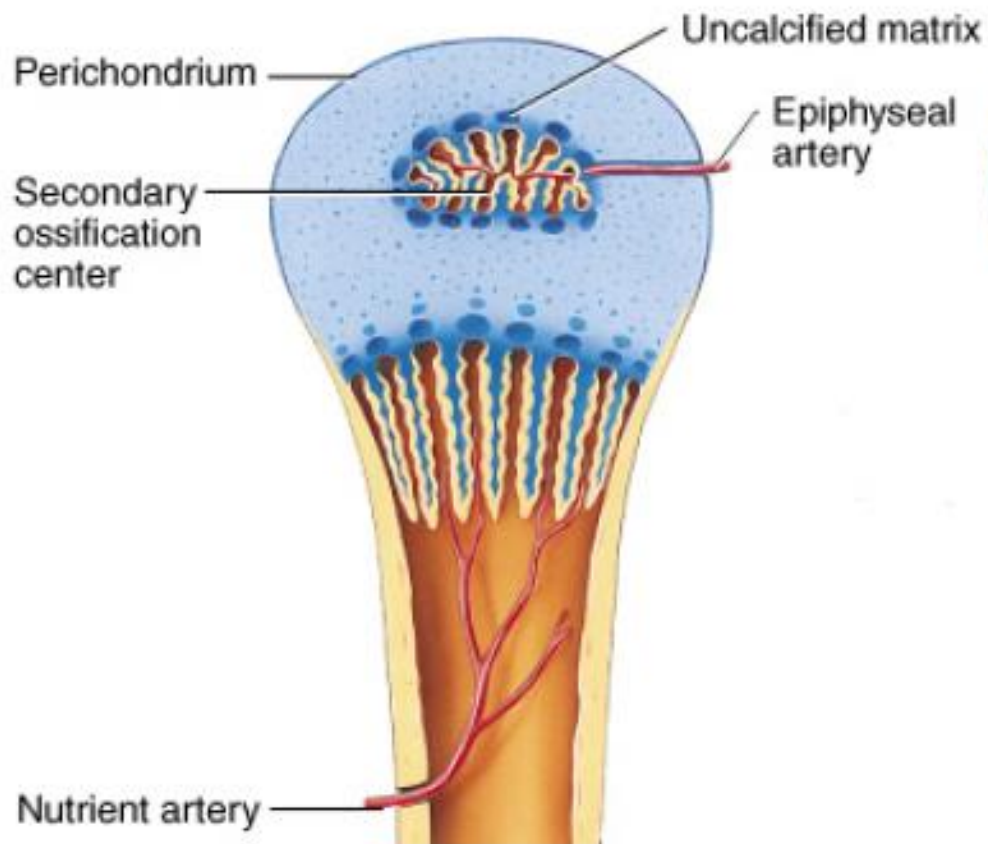


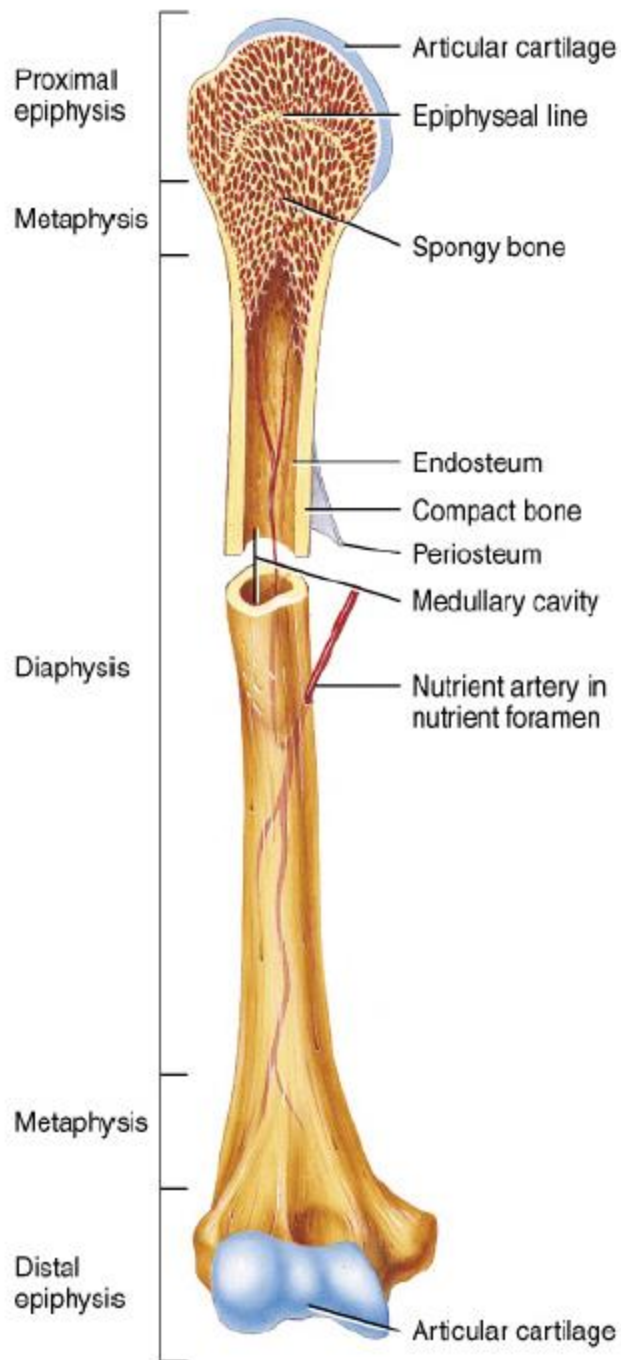
Blood vessel



Proliferating chondrocytes







Epifiz Uzun kemiklerin uçları

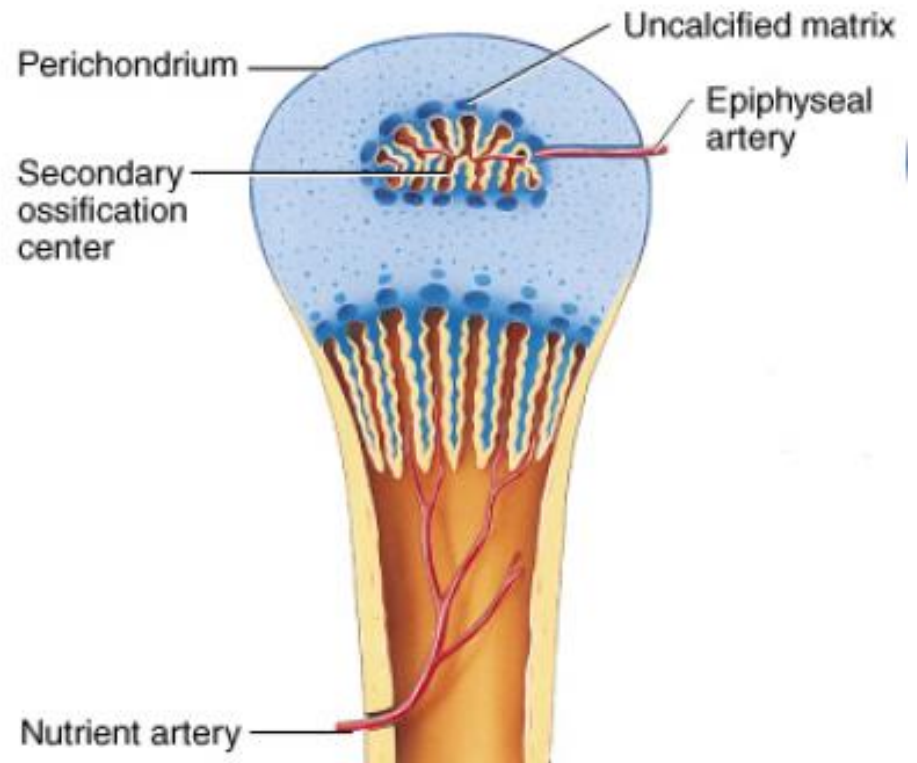
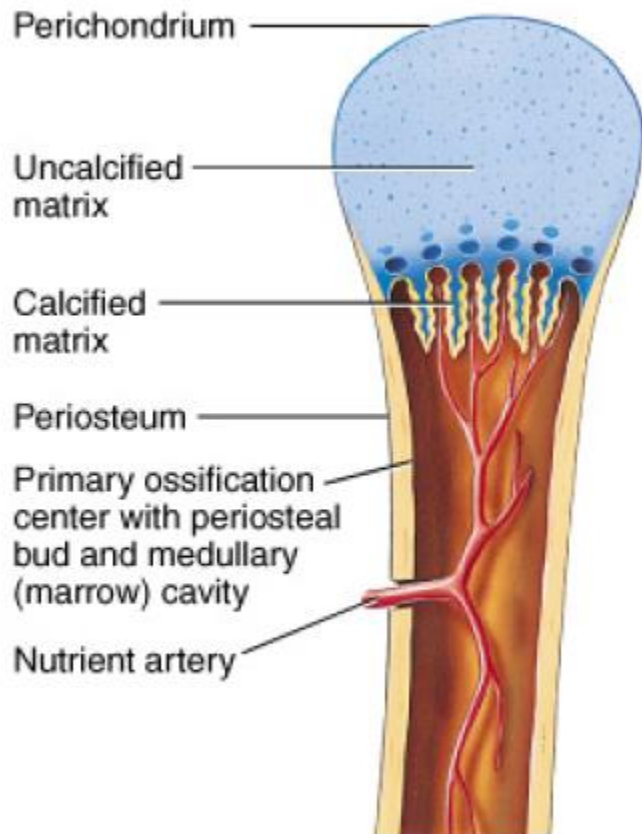
Diafiz Uzun kemiklerin gövdesi

Metafiz epifiz ile diafiz arasında
kemik gelişiminin olduğu
bölge

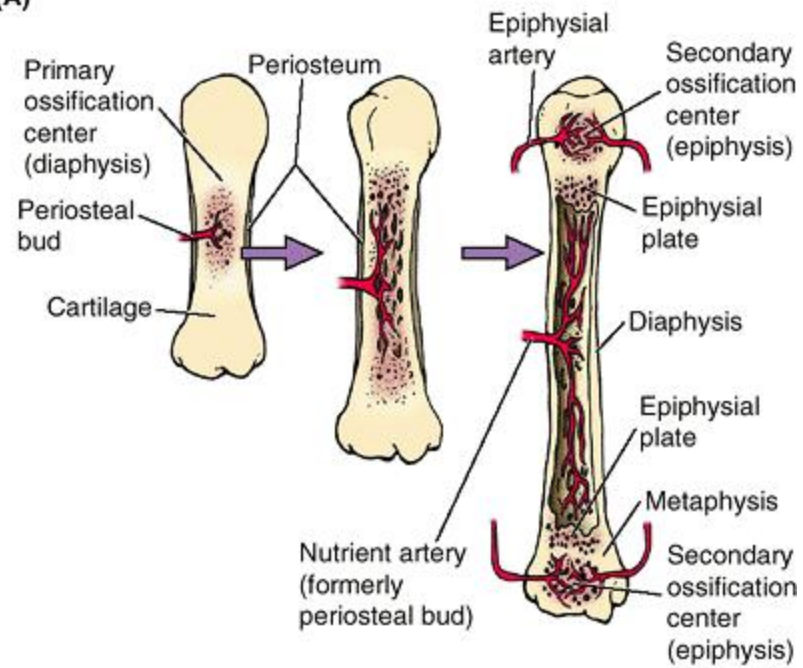
Kemikleşme merkezleri

Primer kemikleşme merkezi

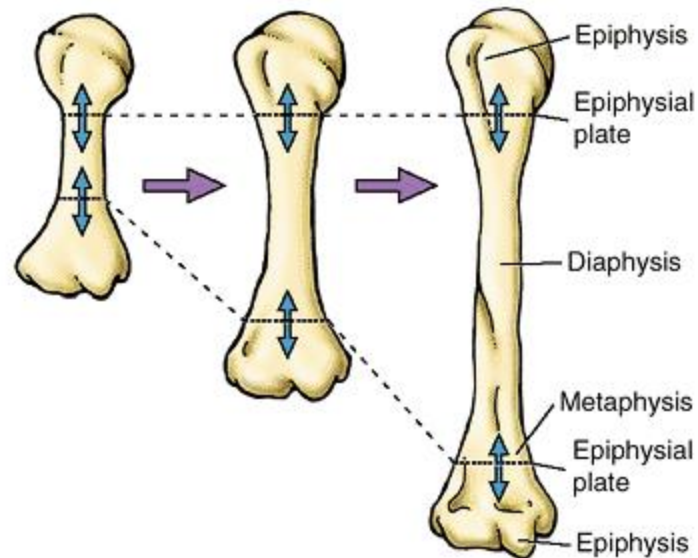
Sekonder kemikleşme merkezi (Cartilago epiphysialis)



(A)



(B)



Epifiz kırırdağı





A greenstick fracture is incomplete, and the break occurs on the convex surface of the bend in the bone.



A fissured fracture involves an incomplete longitudinal break.



A comminuted fracture is complete and fragments the bone.



A transverse fracture is complete, and the break occurs at a right angle to the axis of the bone.



An oblique fracture occurs at an angle other than a right angle to the axis of the bone.



A spiral fracture is caused by twisting a bone excessively.



(a) Open fracture



(b) Comminuted fracture



(c) Greenstick fracture



(d) Impacted fracture



Percivall Pott
(1714-1788)



(e) Pott's fracture

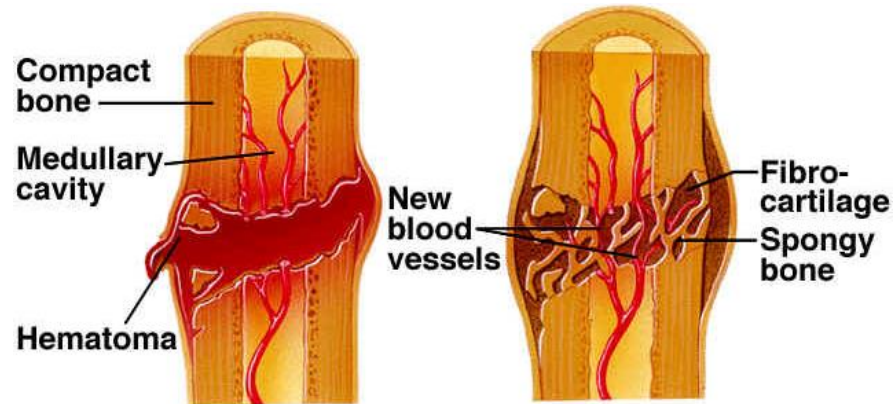


(f) Colles' fracture



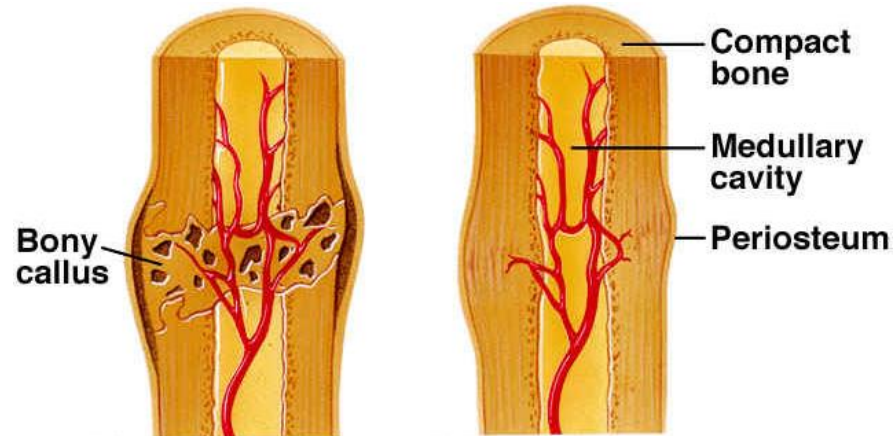
Abraham Colles
(1773-1843)

KEMİK DOKUSUNUN REJENERASYONU



Blood escapes from ruptured blood vessels and forms a hematoma.

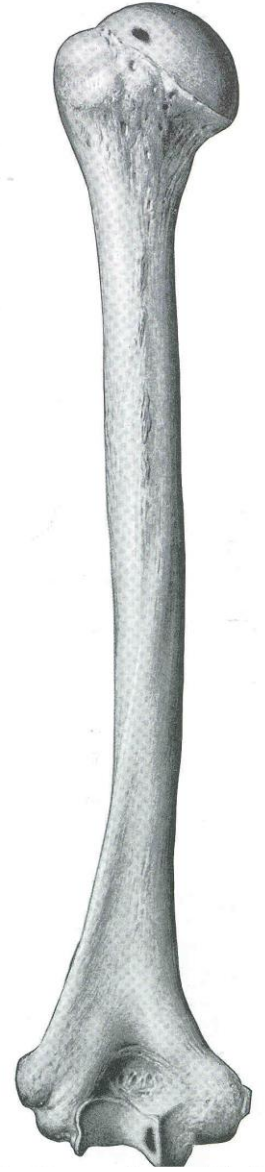
Spongy bone forms in regions close to developing blood vessels, and fibrocartilage forms in more distant regions.



A bony callus replaces fibrocartilage.

Osteoclasts remove excess bony tissue, restoring new bone structure much like the original.

Corpus	: Uzun kemiklerin gövde kısımları
Caput	: Baş kısımları
collum	: Corpus- caput arası, boyun
extremitas proximalis	: Vücuda yakın olan proksimal ucu
extremitas distalis	: Vücuttan uzak olan distal ucu
Sulcus	: Oluk
Tuberculum	: Tümsek, yumrucuk
Tuberositas	: Engebeli çıkıntı, pürtük
Capitulum	: Başçık
Crista	: İbik şeklinde kenar, çıkıntı
Foveola	: Çok küçük ve sığ çukurcuk
Spina	: Diken, ucu sivri çıkıntı
Foramen	: Delik



Kemiklerin şekillerine göre sınıflandırılması

Ossa longa (Uzun kemikler)

Ossa breve (Kısa kemikler)

Ossa plana (Yassı kemikler)

Ossa irregularia , informia (Düzensiz kemikler)

Ossa pneumaticum (Havalı kemikler)

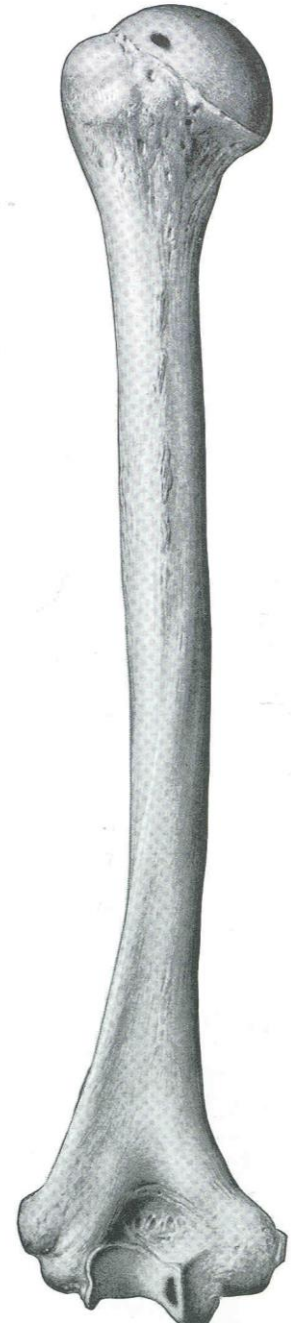
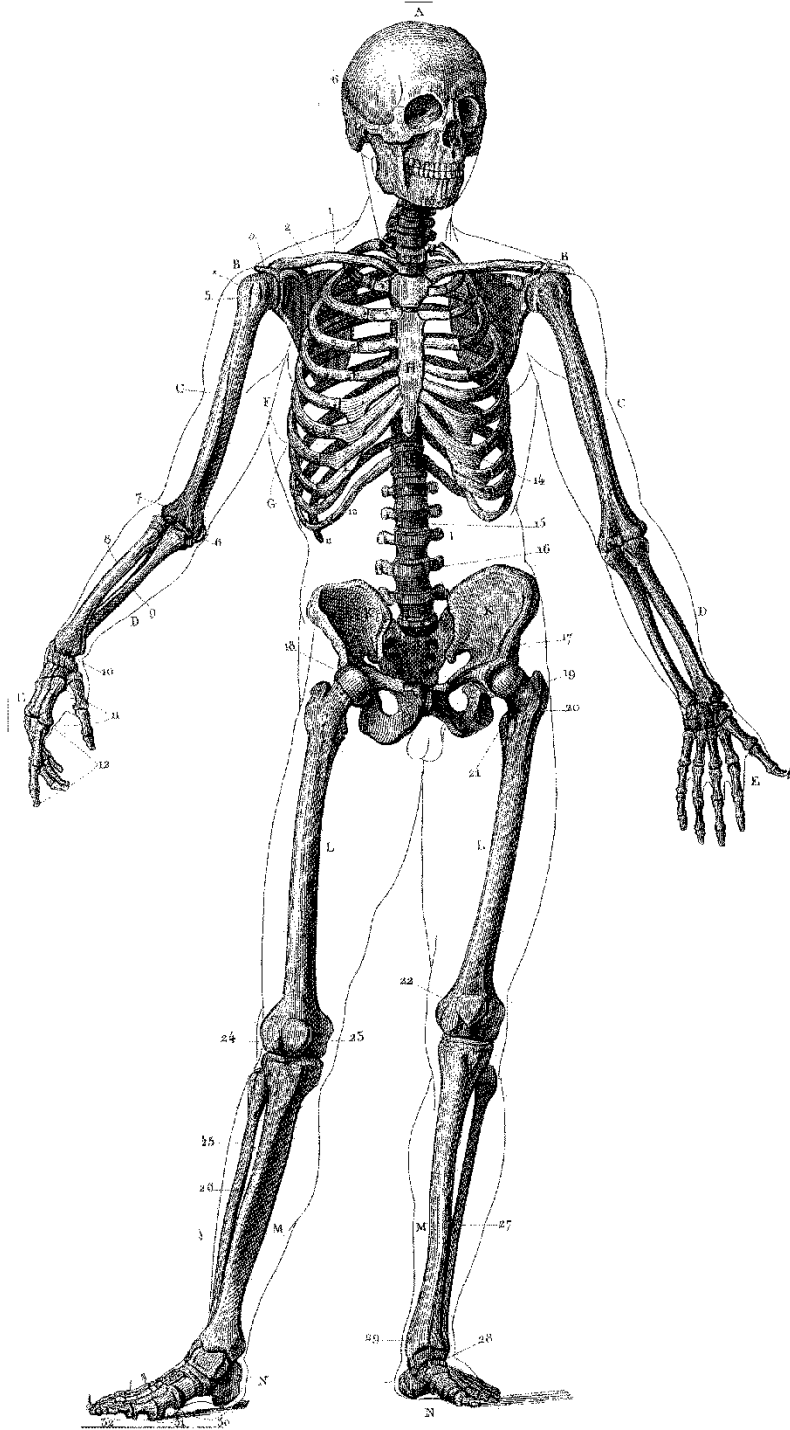
Ossa sesamoidea

(patella, os pisiforme)

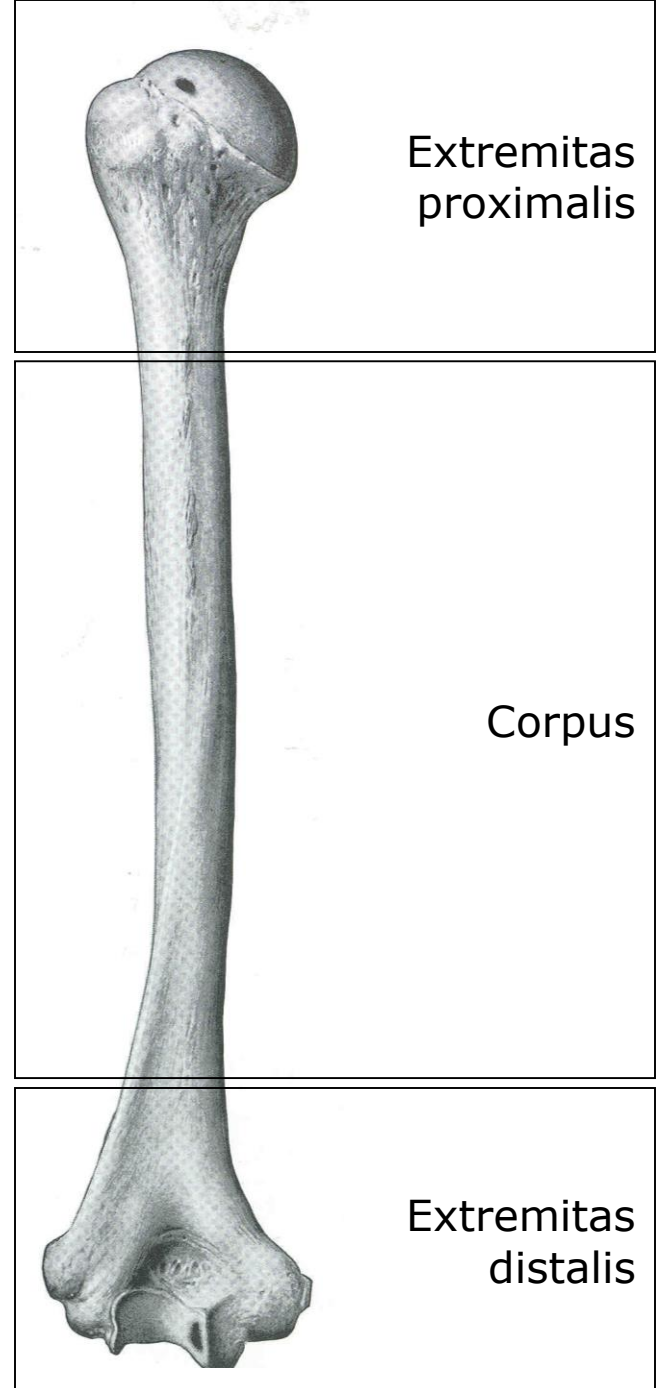
Ossa accessoria

(Os trigonum, os fabella, os vesalinum pedis)

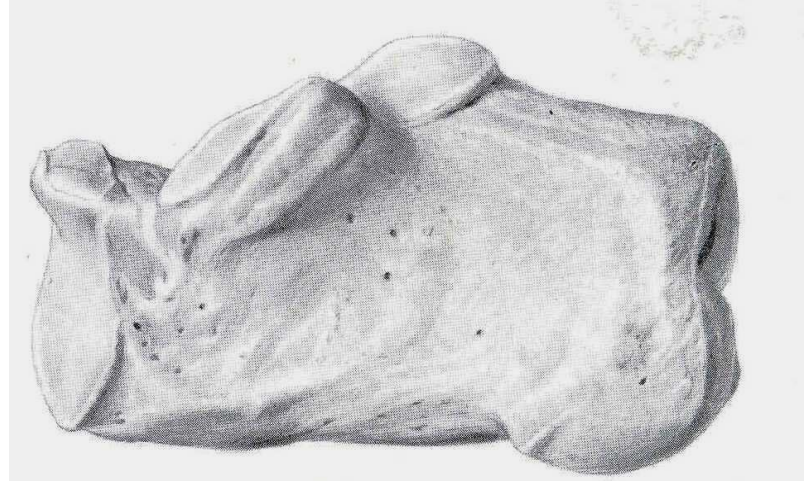
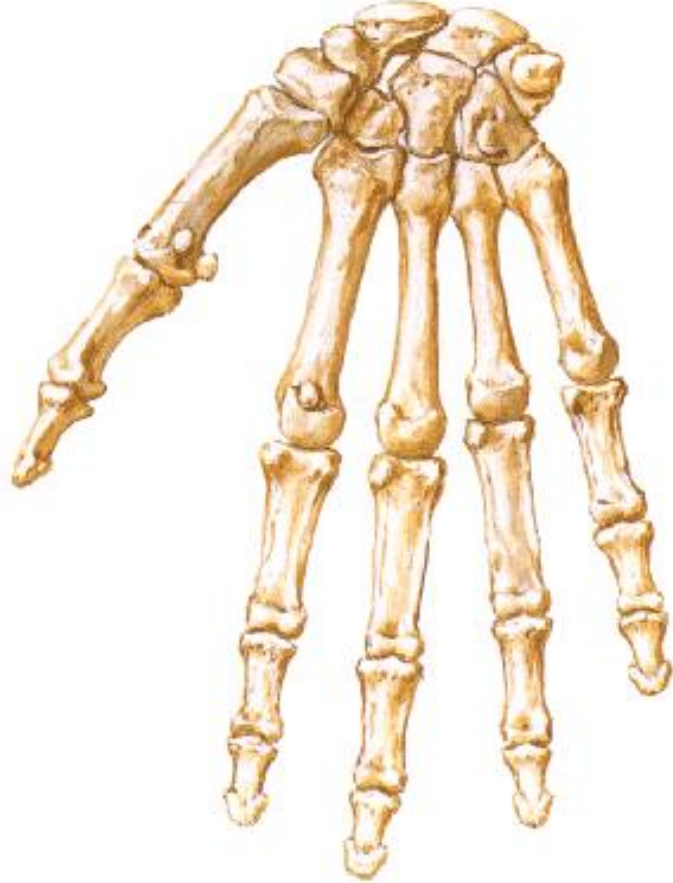
Ossa longa



Uzun kemiklerin iki ucu, bir gövdesi vardır



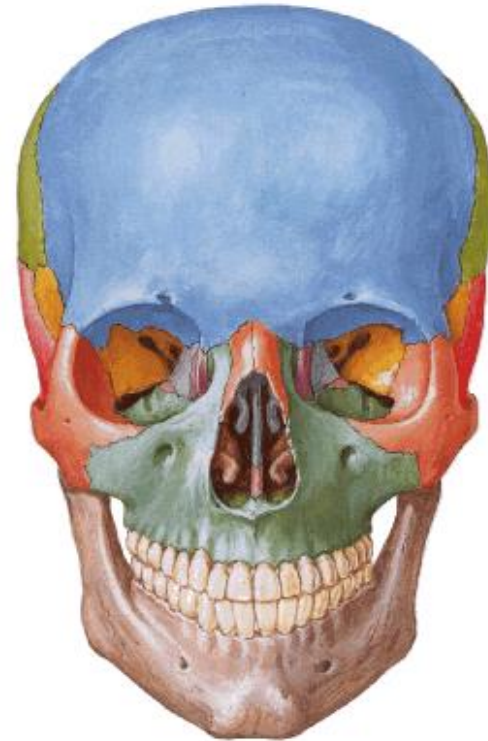
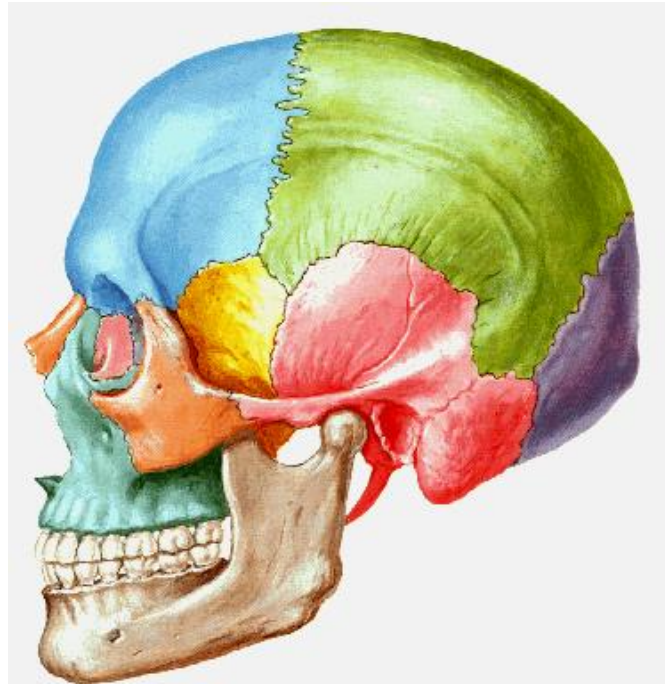
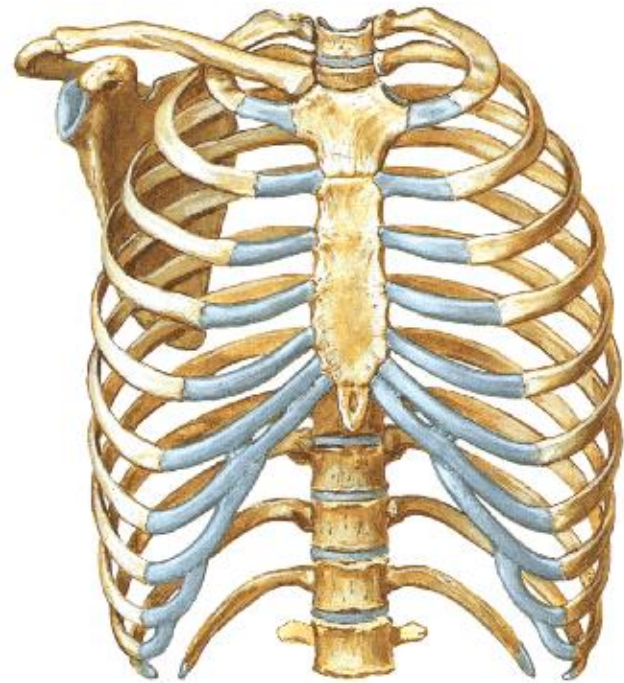
Ossa breve



Şek. 9 = Calcaneus (topuk kemiği). Kısa kemiklere (os breve) örnek.



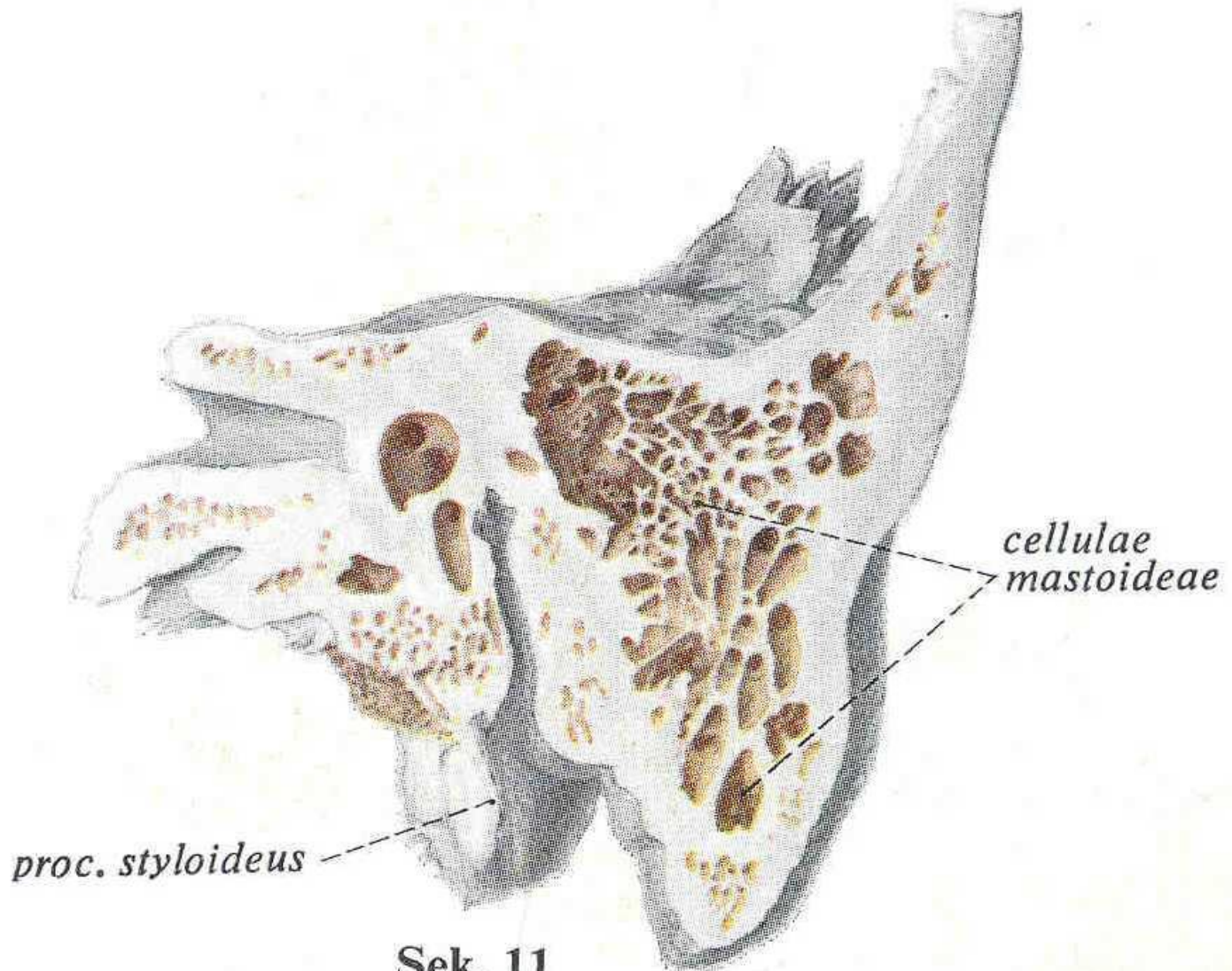
Ossa plana

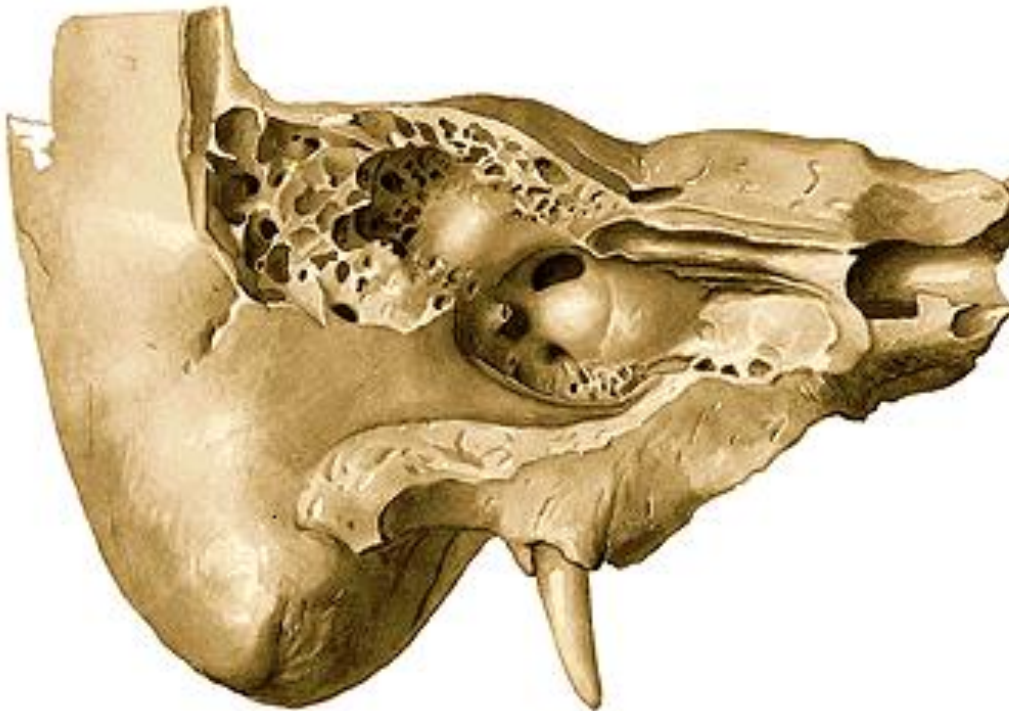
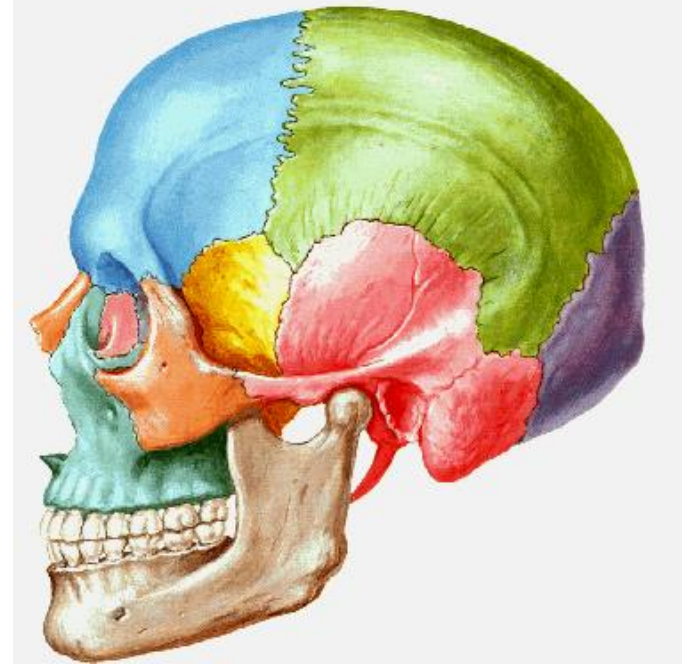
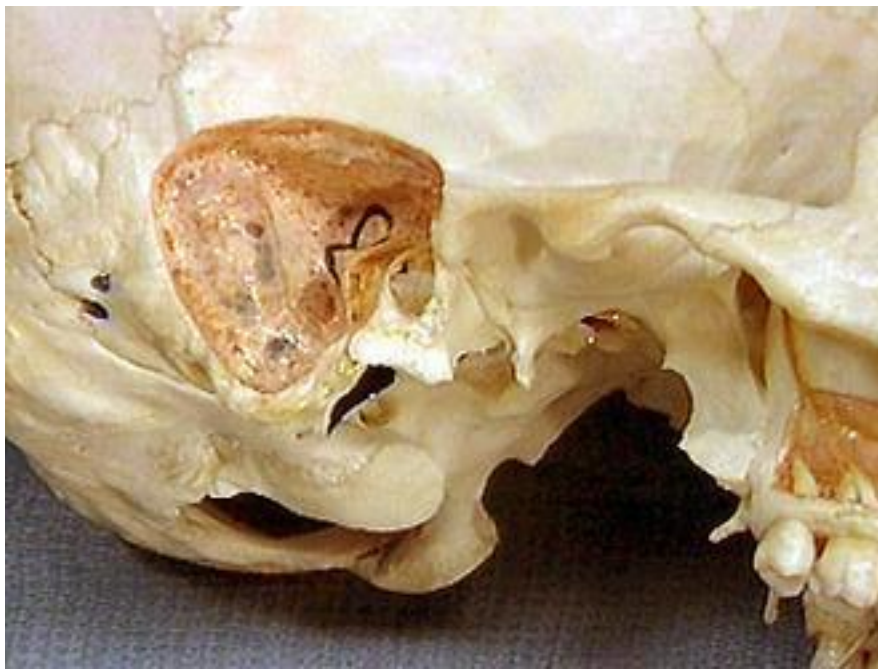


Ossa irregolare

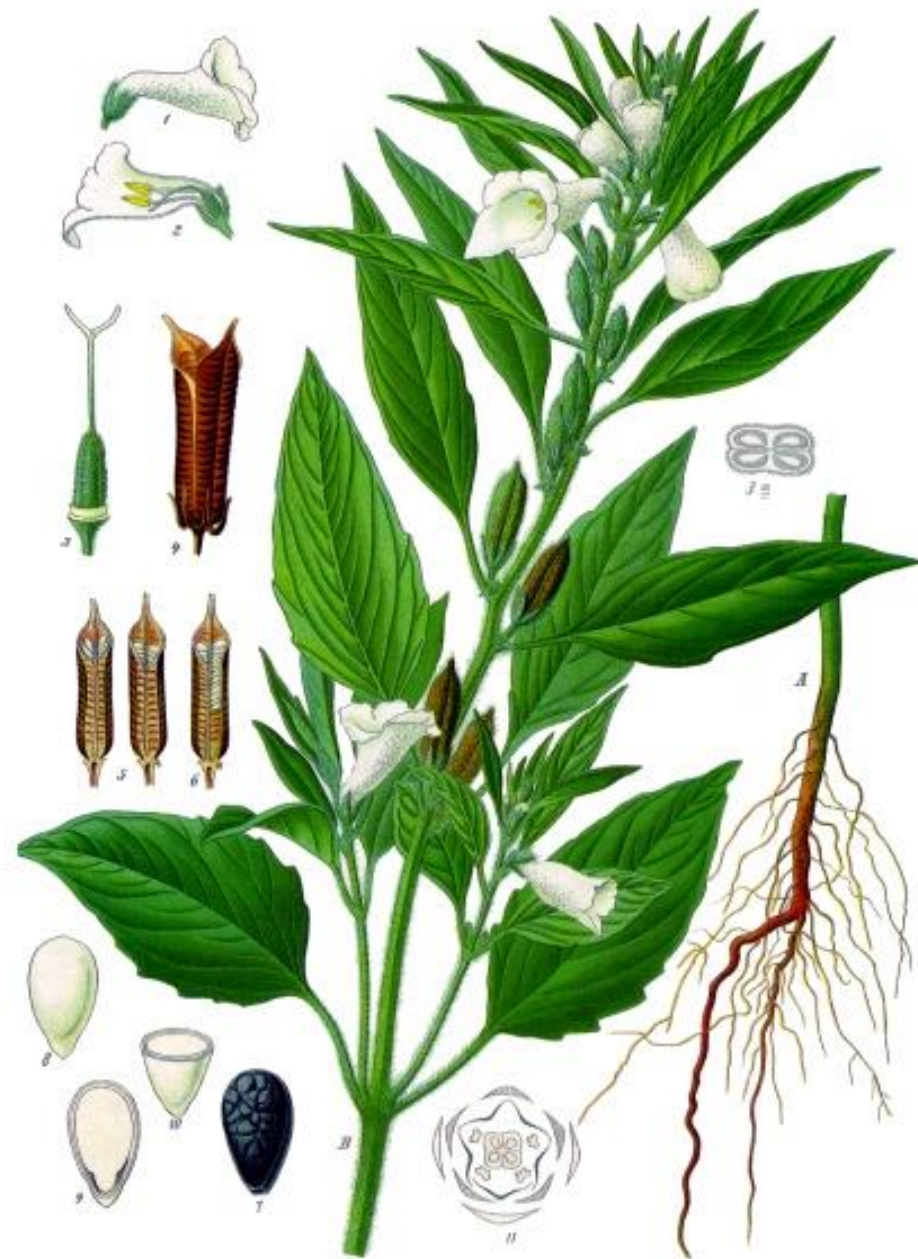


Ossa pneumaticum

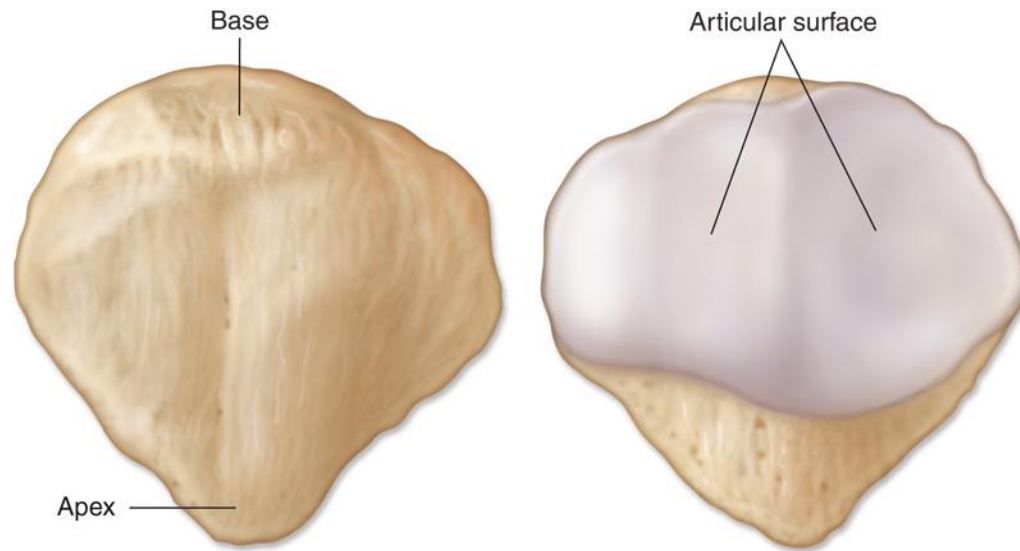


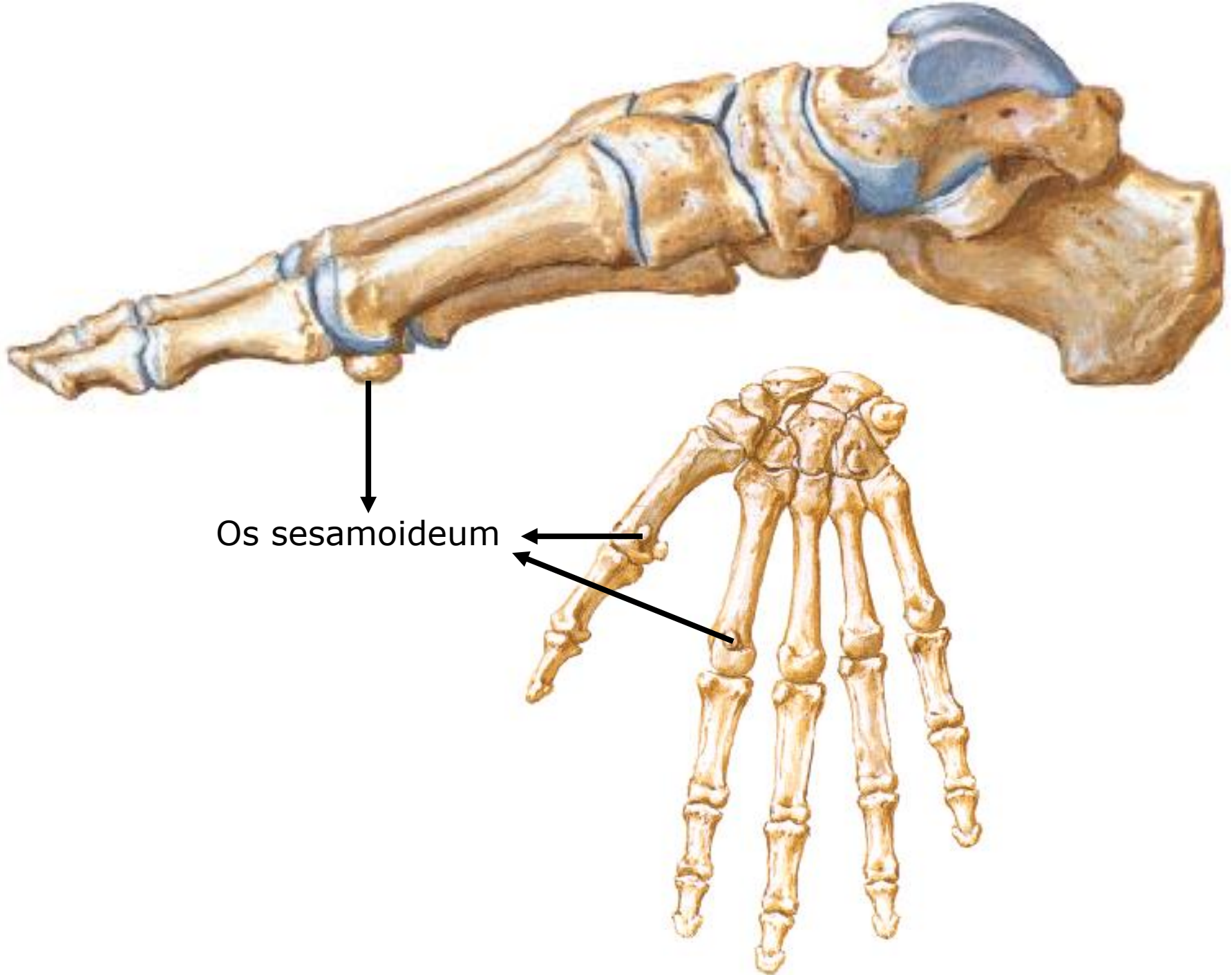


Os sesamoideum



PATELLA

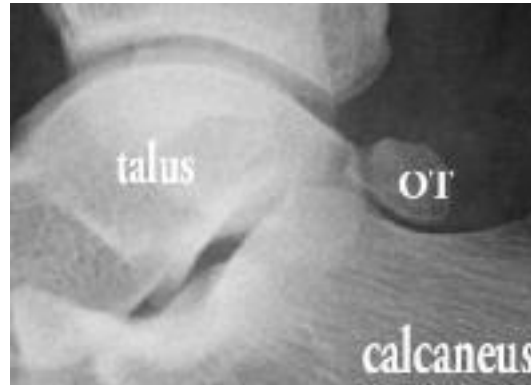




Ossa accessoria



Os fabella

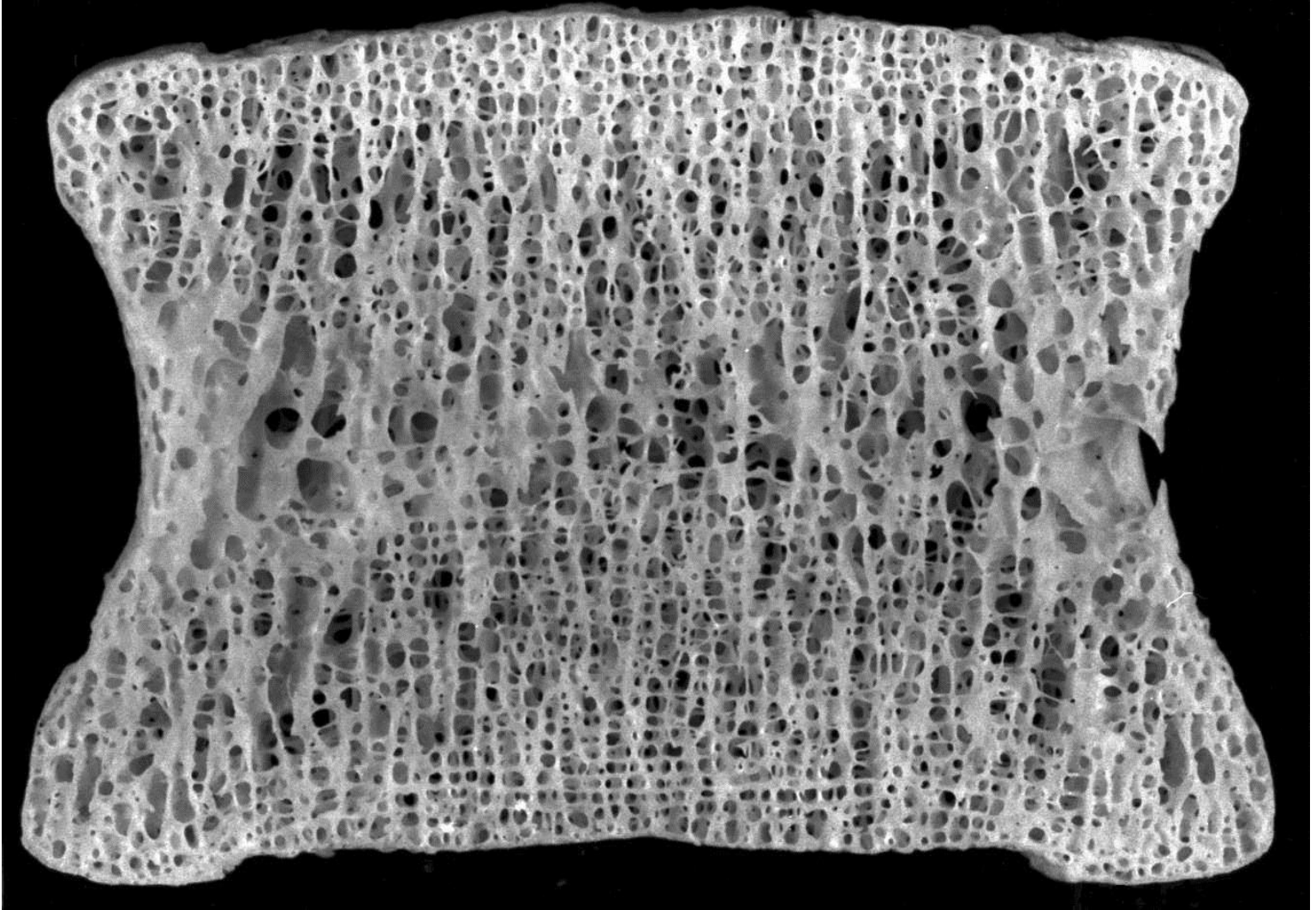


Os trigonum



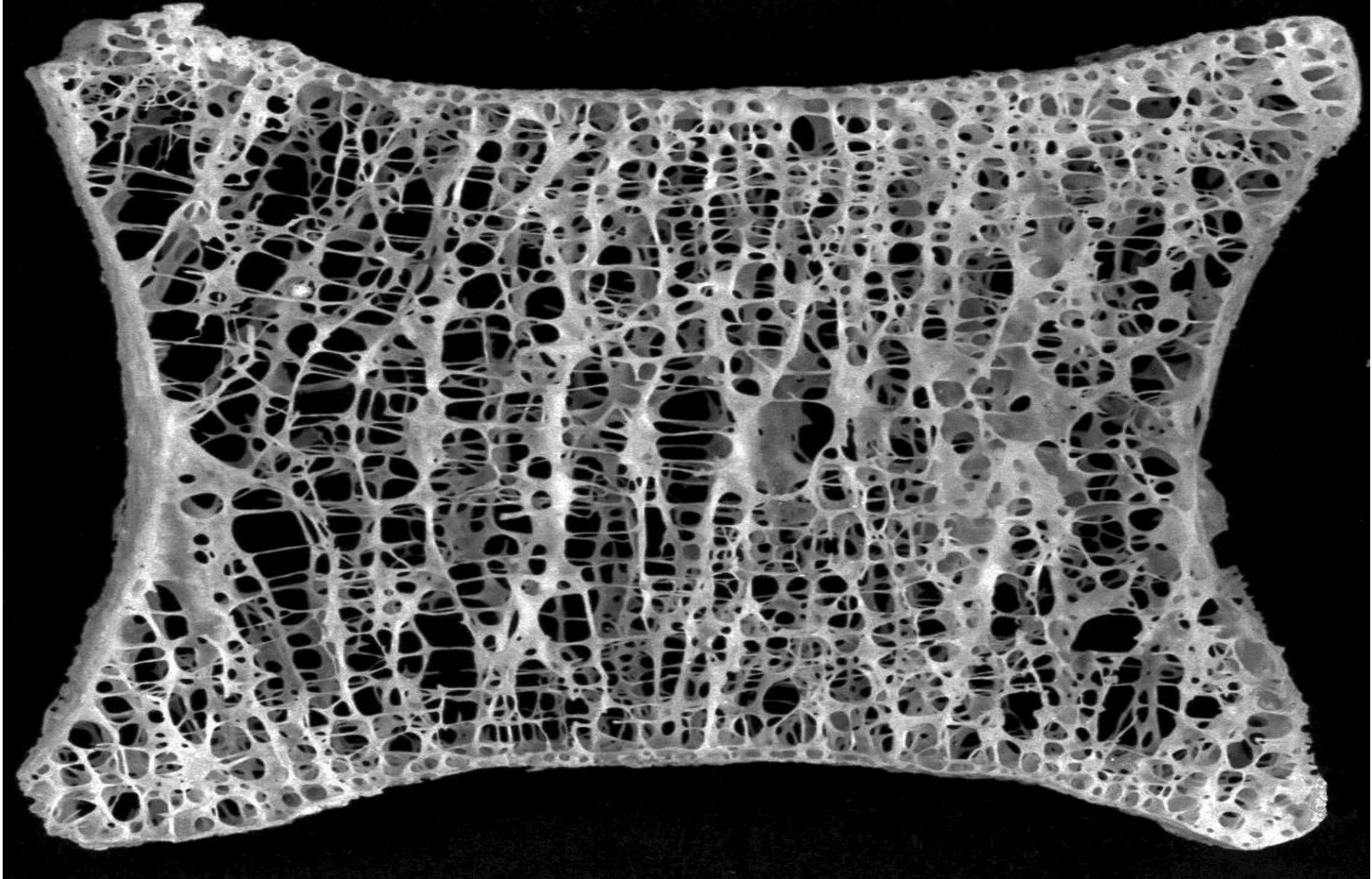
Os vesalinum

Normal Kemik

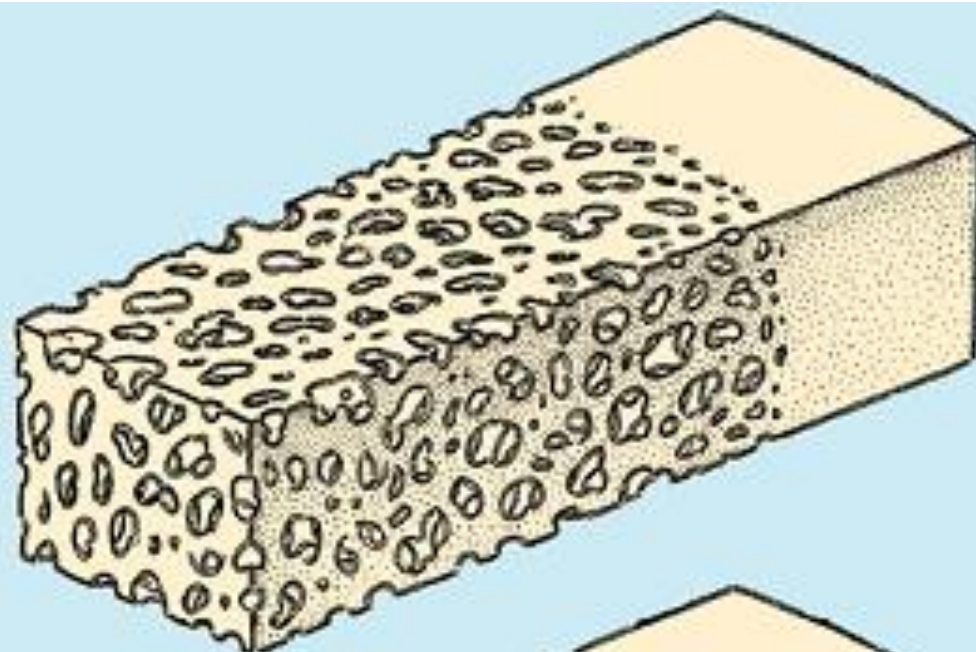


30 yaşında bir bayan

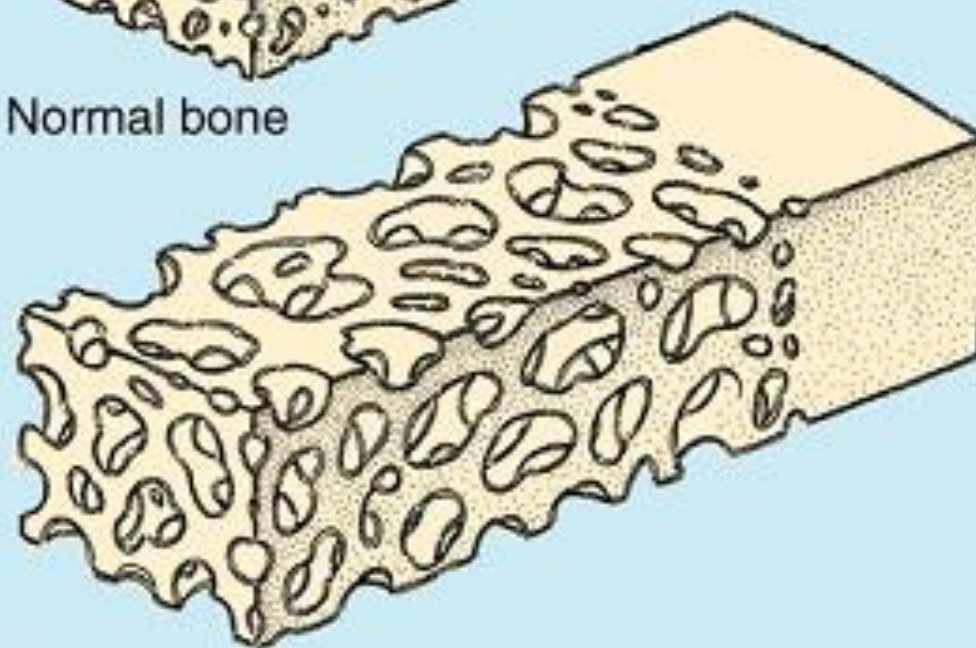
Osteoporoz



88 yaşıında bir bayan



Normal bone



Osteoporotic bone