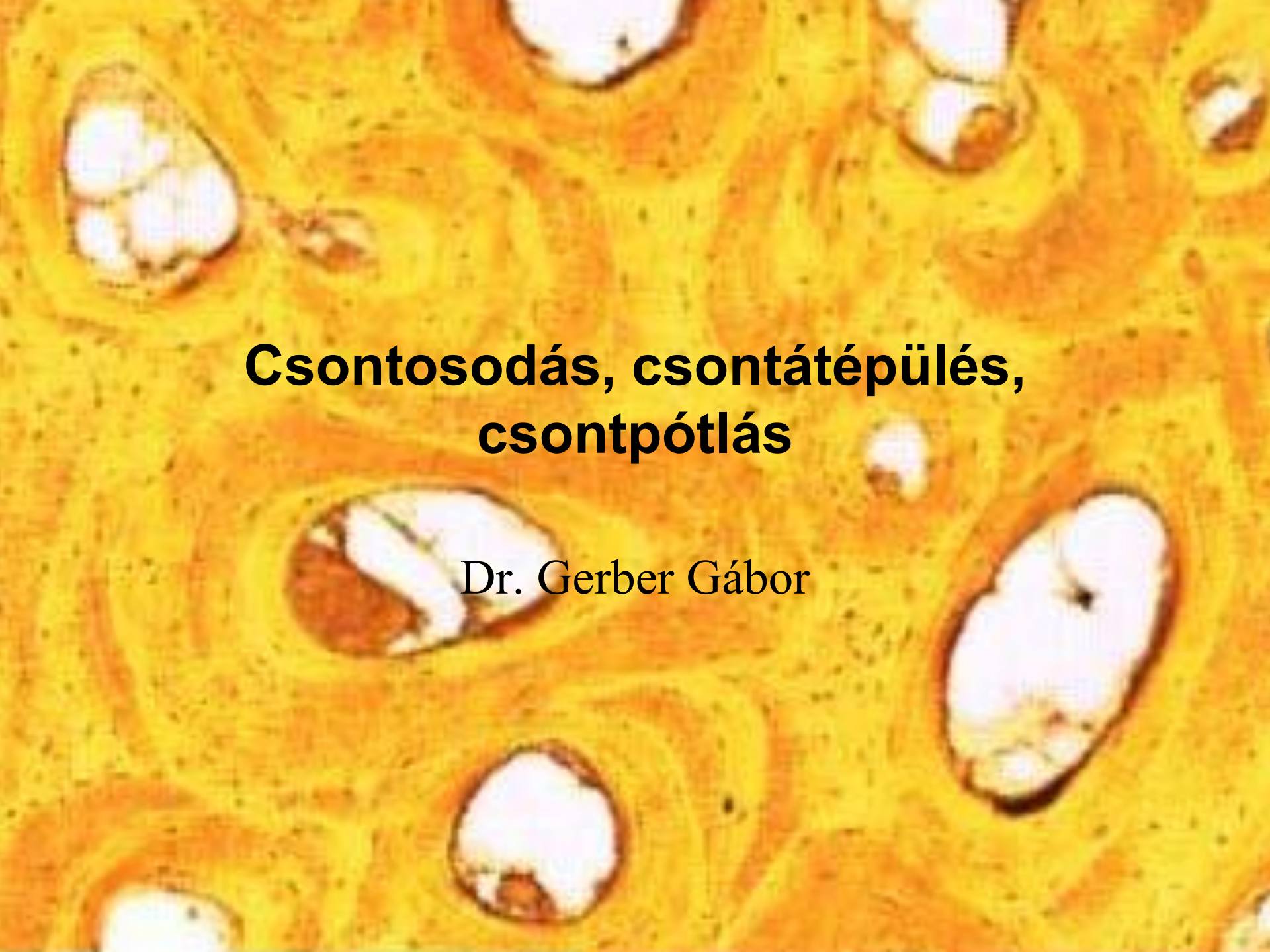
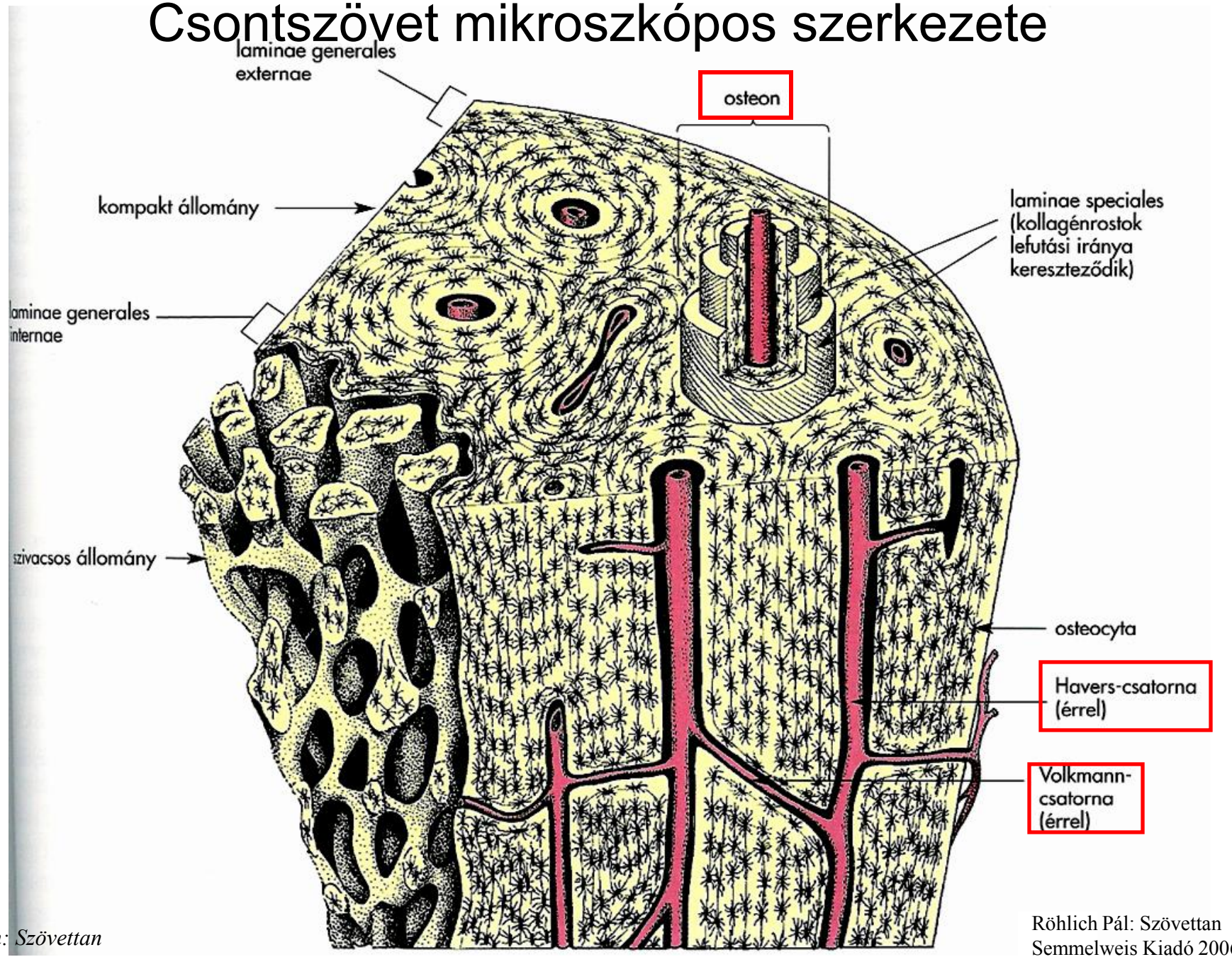


Csontosodás, csontátépülés, csontpótlás

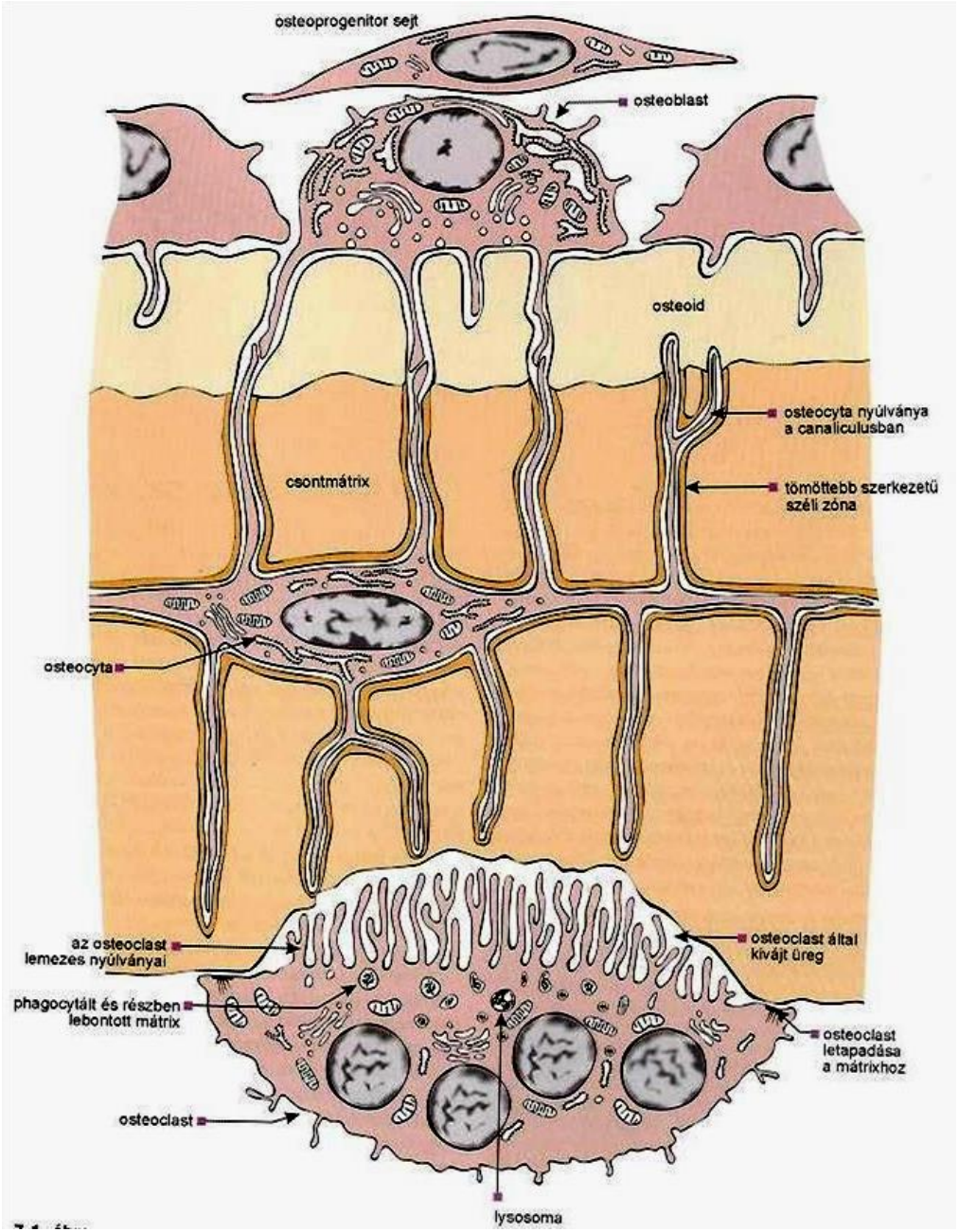
Dr. Gerber Gábor

Csontszövet mikroszkópos szerkezete



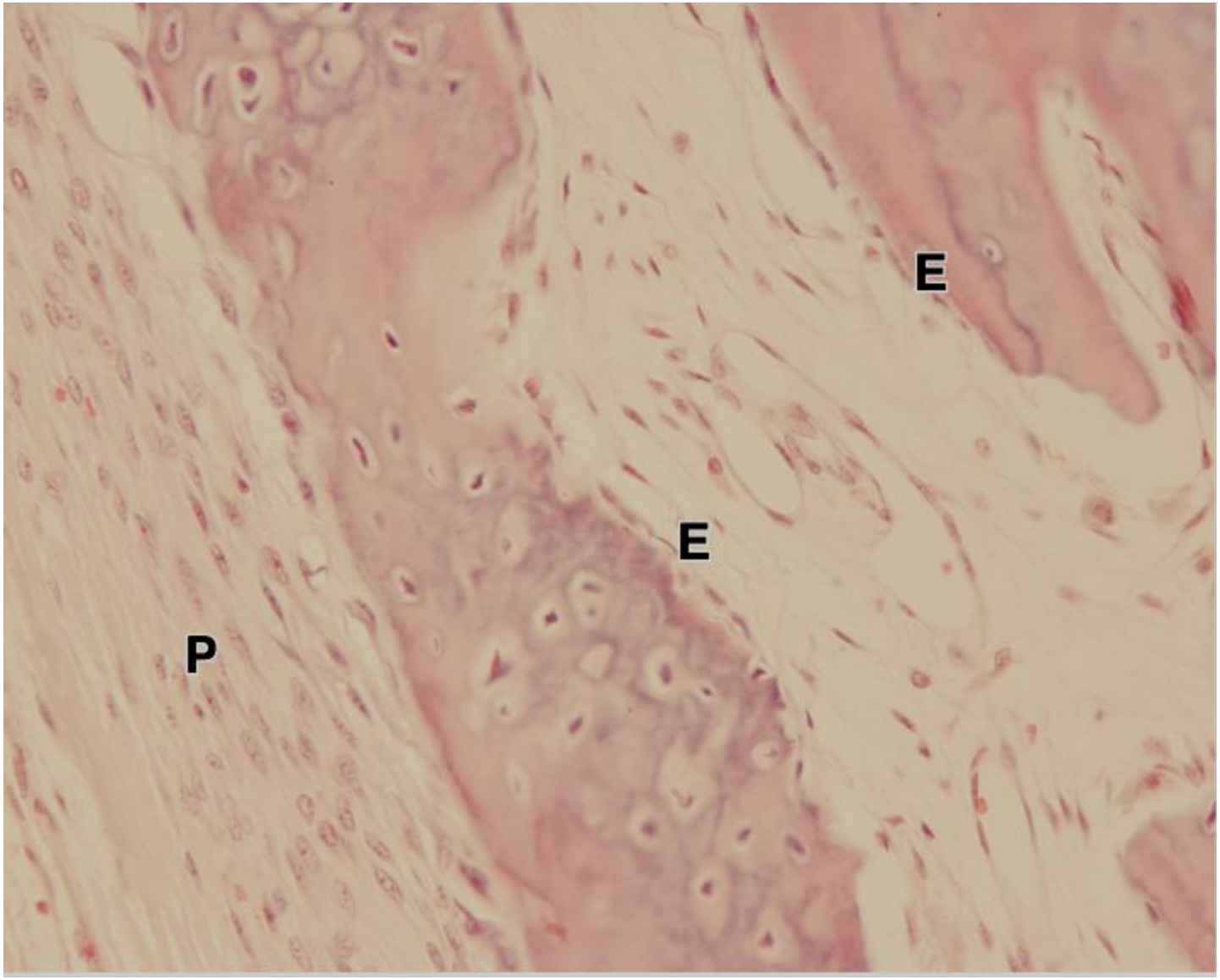
Röhlich Pál: Szövettan
Semmelweis Kiadó 2006

Csontszövet sejtjei



Röhlich: Szövettan

Periosteum és endosteum



Junqueira's: Basic histology

Csontosodás

Primer (angiogén) csontosodás:

Ritkaság

Differenciálatlan mesenchymális sejtek közvetlenül alakulnak át osteoblastokká, majd azok osteocytákká

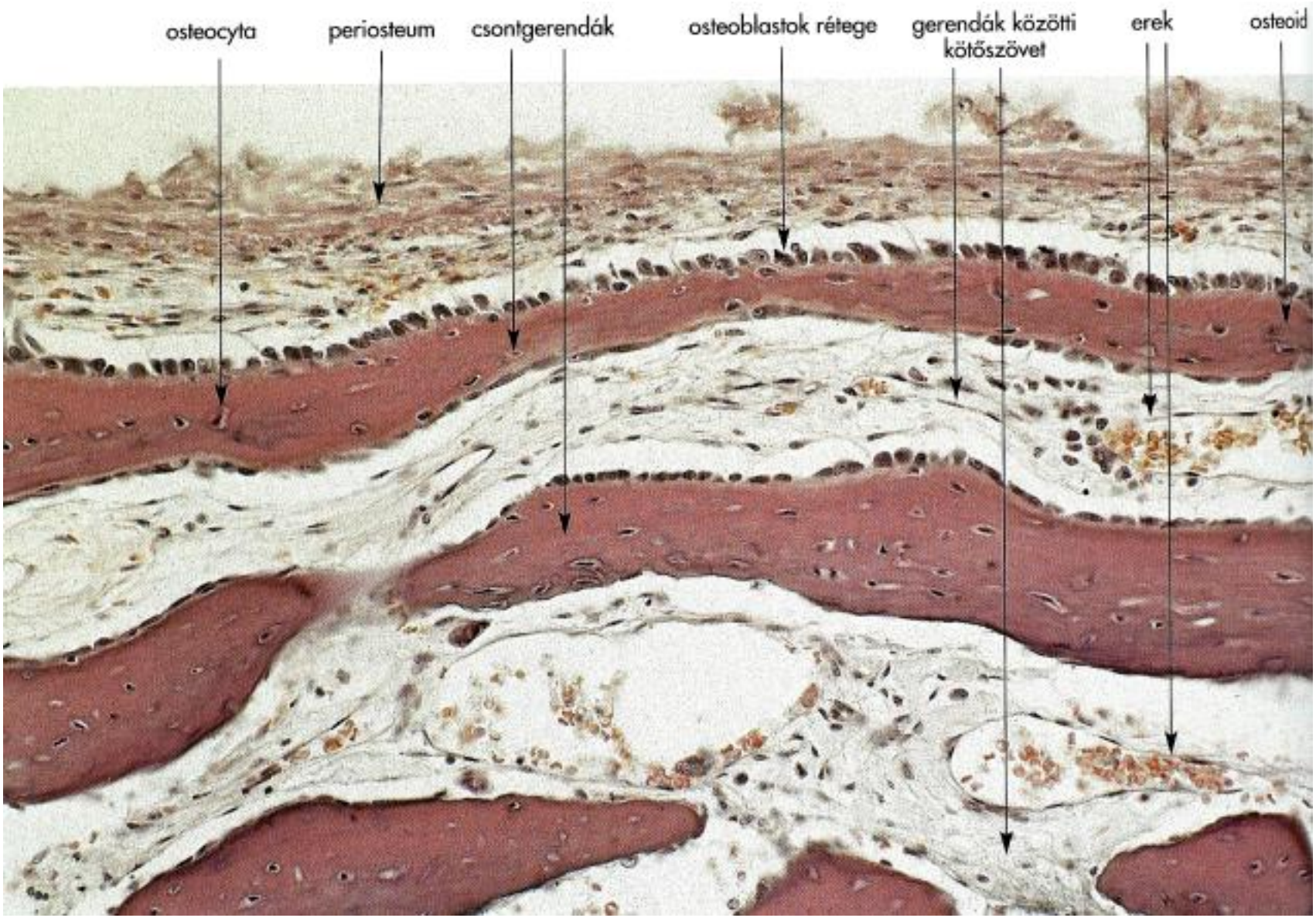
Szekunder csontosodás:

Valamilyen meglevő szövet alakul át csontszövetté

Kötőszövet → desmalis csontosodás

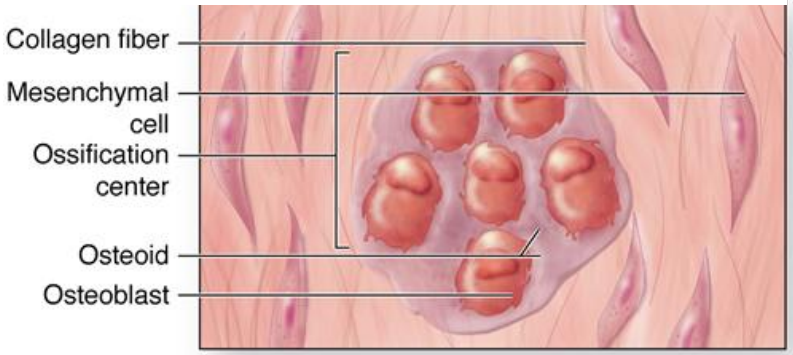
Porcszövet → chondralis csontosodás

Desmális csontosodás

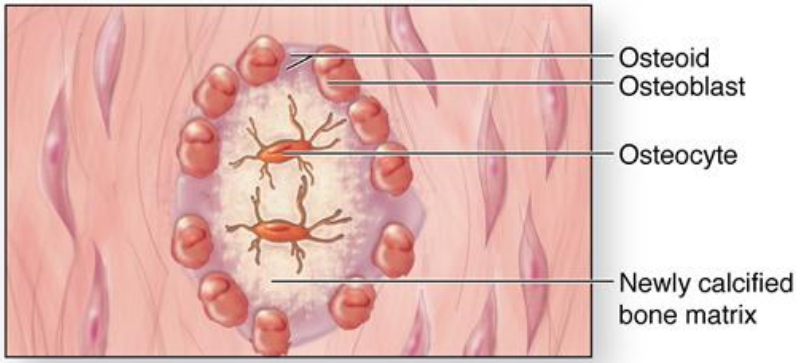


Desmális csontosodás

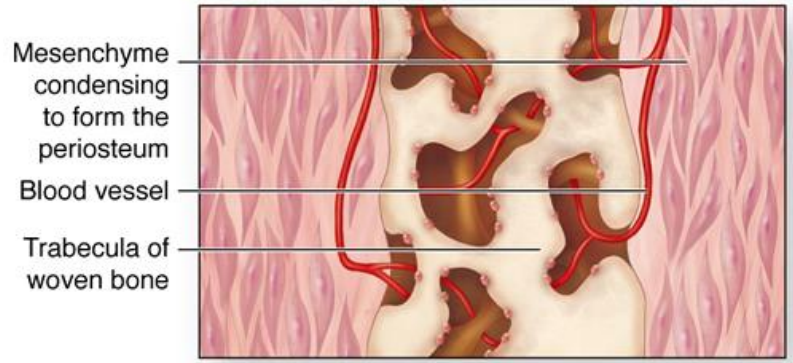
Csontosodási centrum (osteoblast) a megvastagodott mesenchymában osteoid termelés



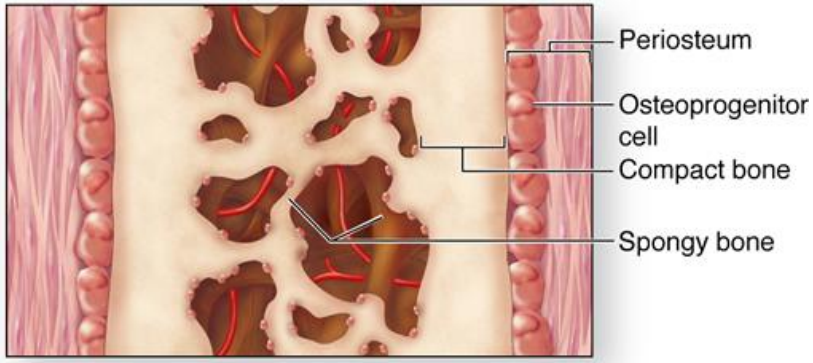
Osteoid elmeszesedése



Fonott csont , periosteum kialakulása



Lemezes csont ,(lamina compacta és spongiosa) kialakulása



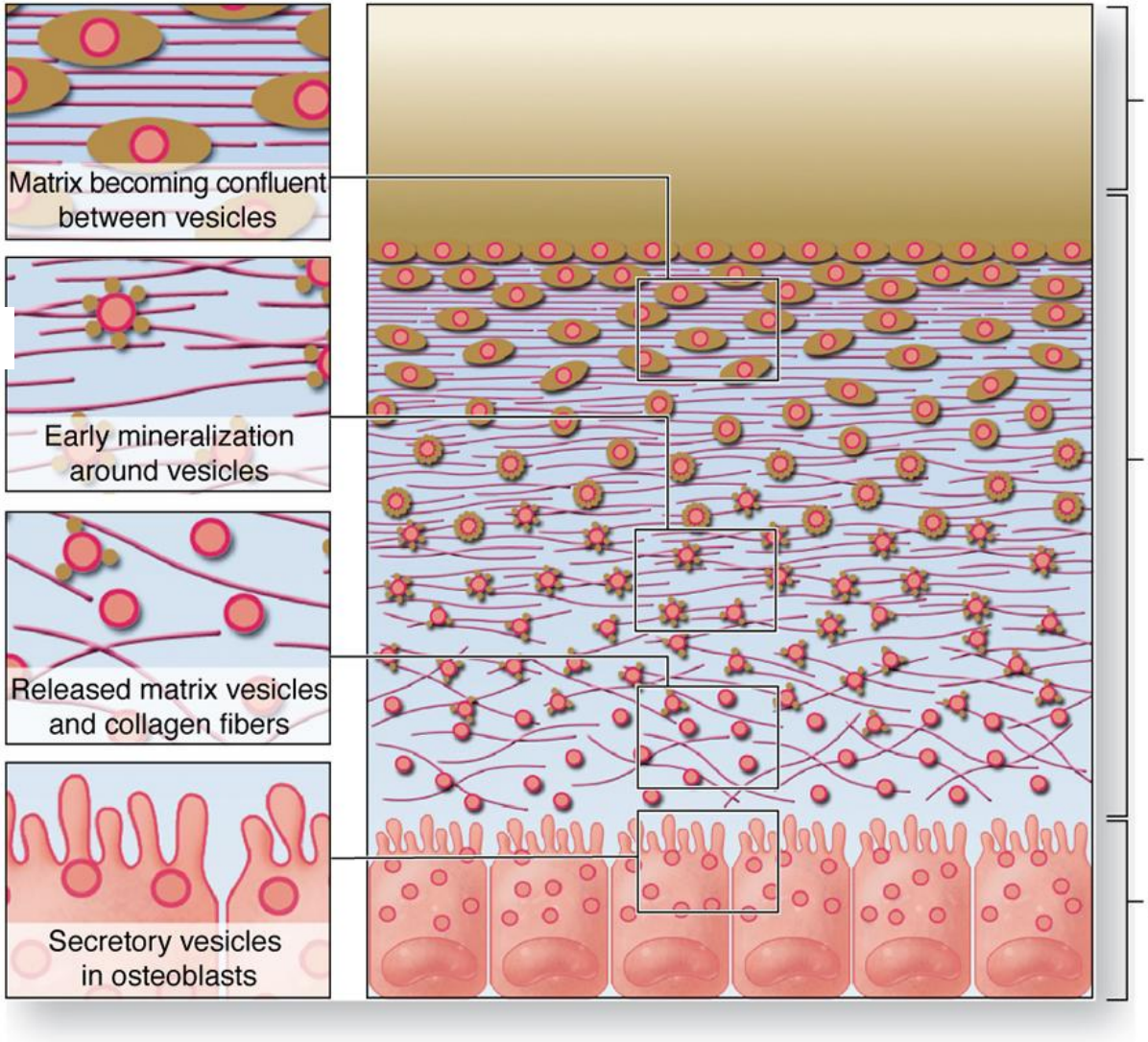
Mineralizáció a csontmatrixban

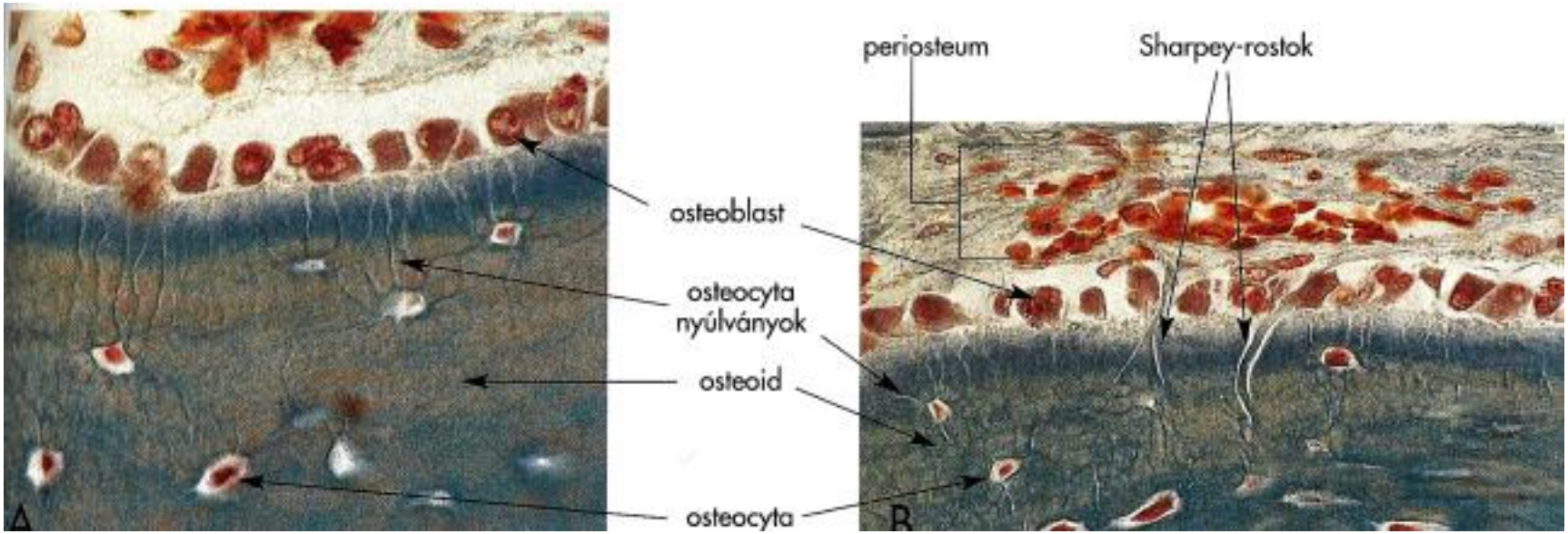
Mineralizálódott csont
(Hydroxyapatit $Ca_{10}(PO_4)6(OH)_2$)

Kristályképződés

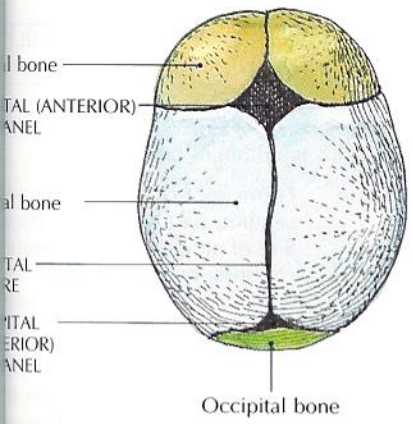
Matrixvezikulák
I-típusú kollagén
glycoproteinek,
proteoglycanok
(osteocalcin
Ca^{2+}kötés)
kibocsájtás

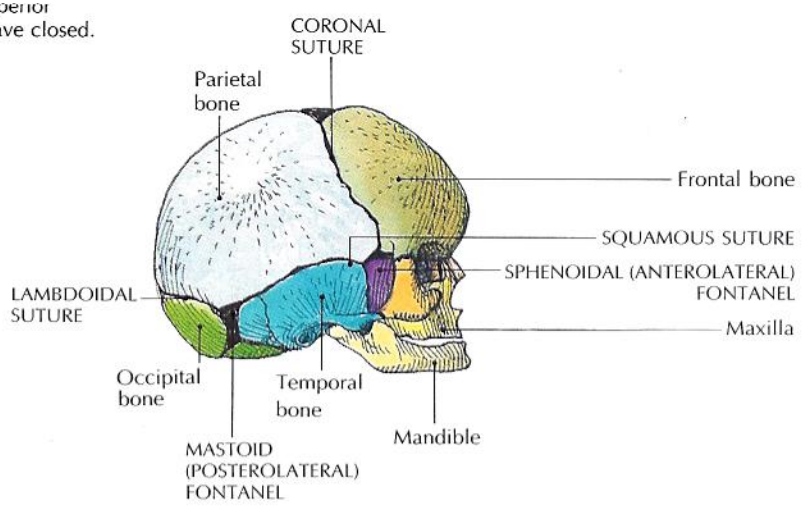
Matrixvezikulák
(alkalikus foszfatáz,
egyéb enzimek)

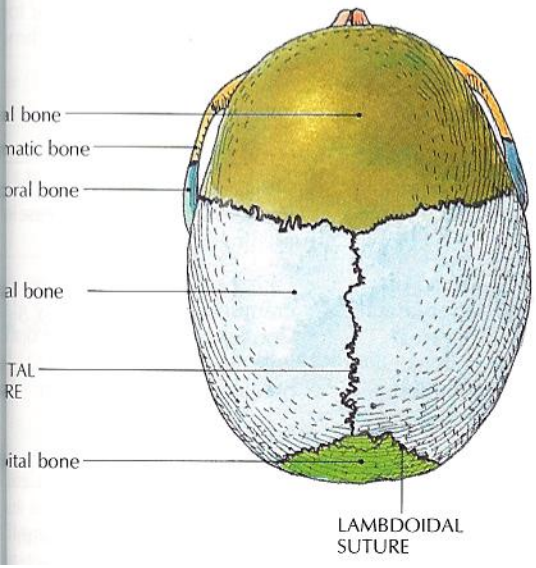


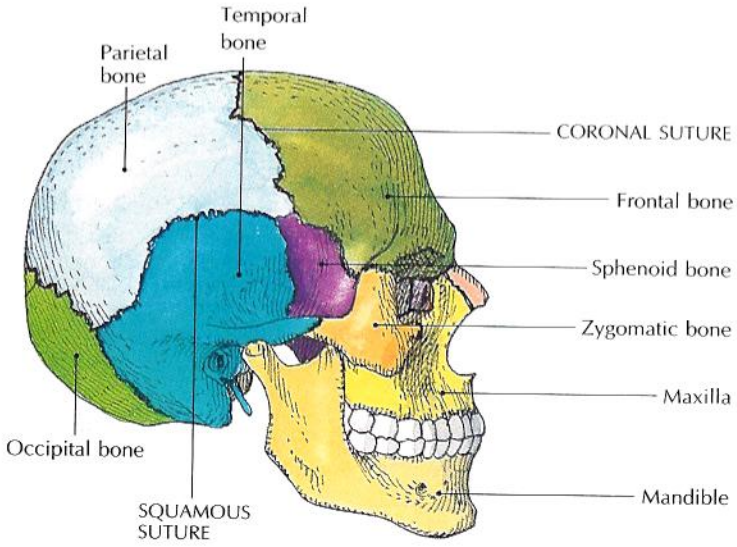

periosteum
Sharpey-rostok
osteoblast
osteocyta nyúlványok
osteoid
osteocyta
A
B

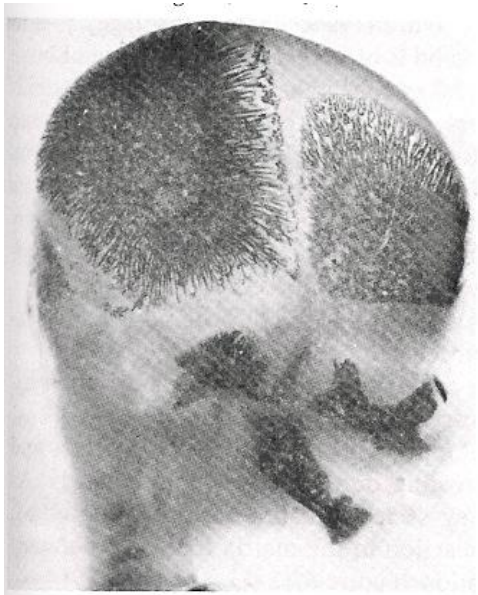
ıor and lateral views. (B) Sutures in an adult skull, superior
ıteral views. Note the absence of fontanels, which have closed.





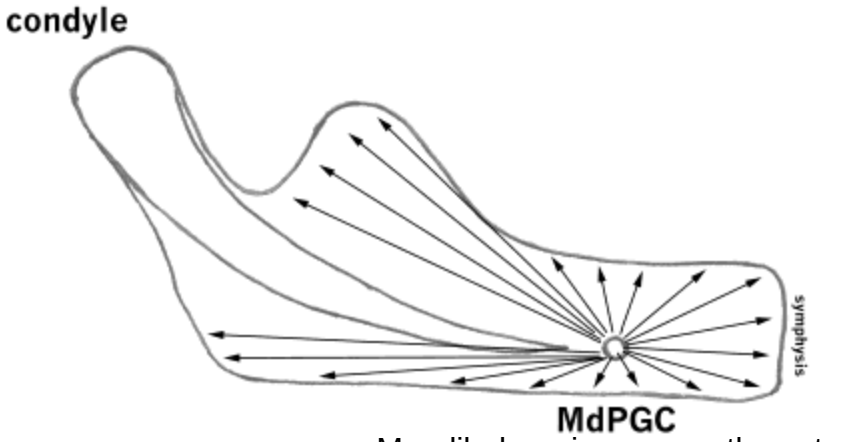




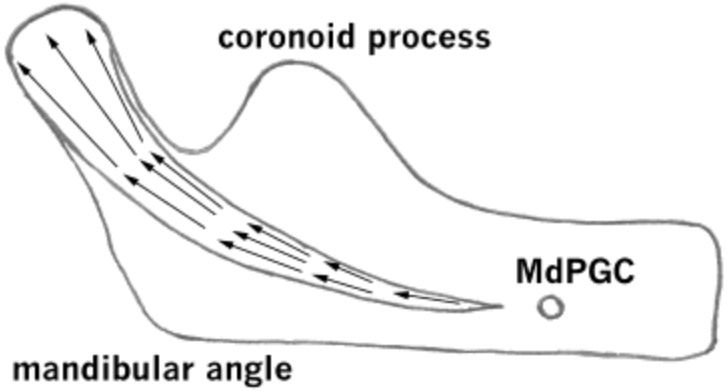


Mandibula kialakulása

Primer csontosodási centrum az első tej moláris gyökércsúcsának megfelelő terület



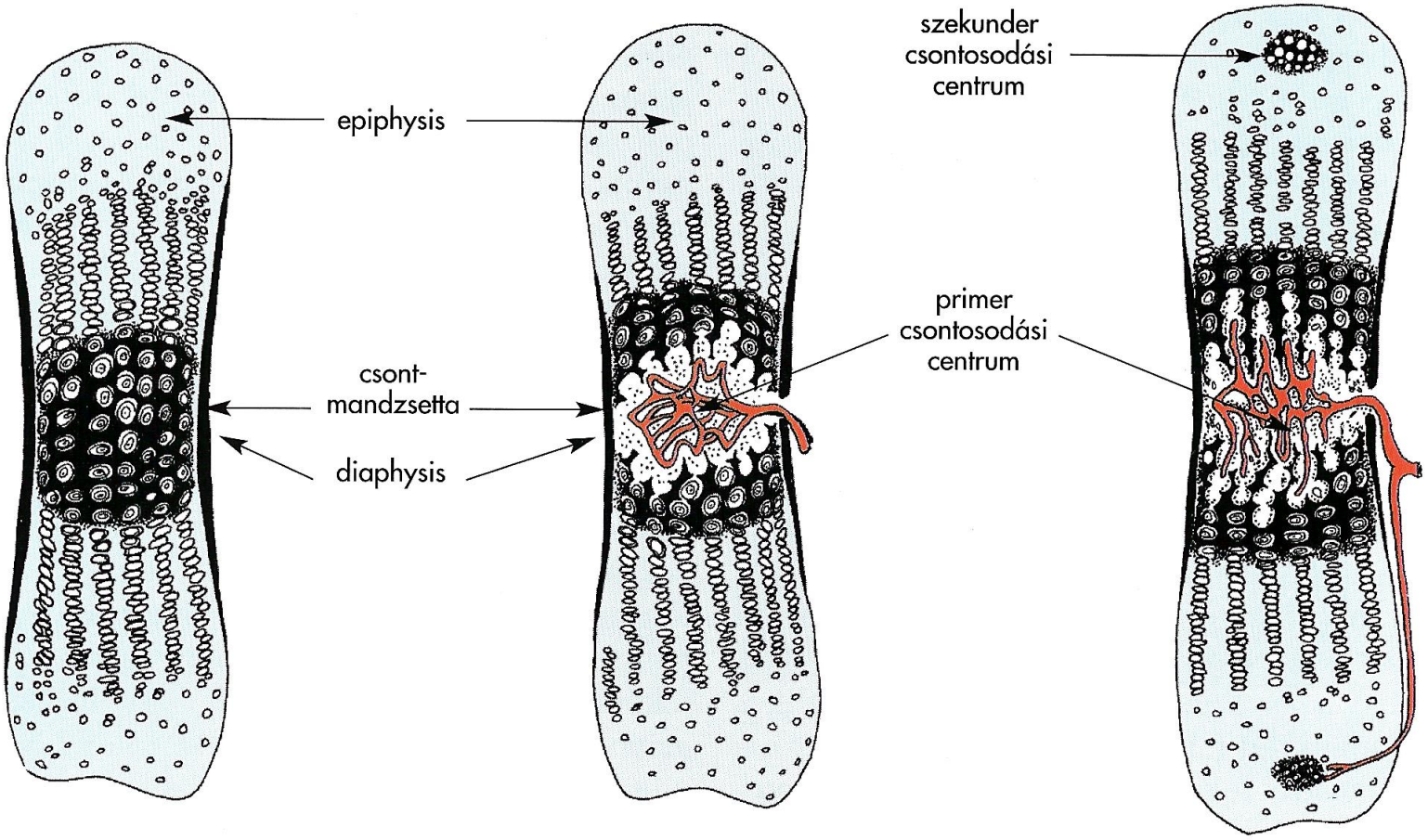
8 hét



14 hét

Prenatal Development of the Human Mandible
Suk Keun et al.
THE ANATOMICAL RECORD 263:314–325 (2001)

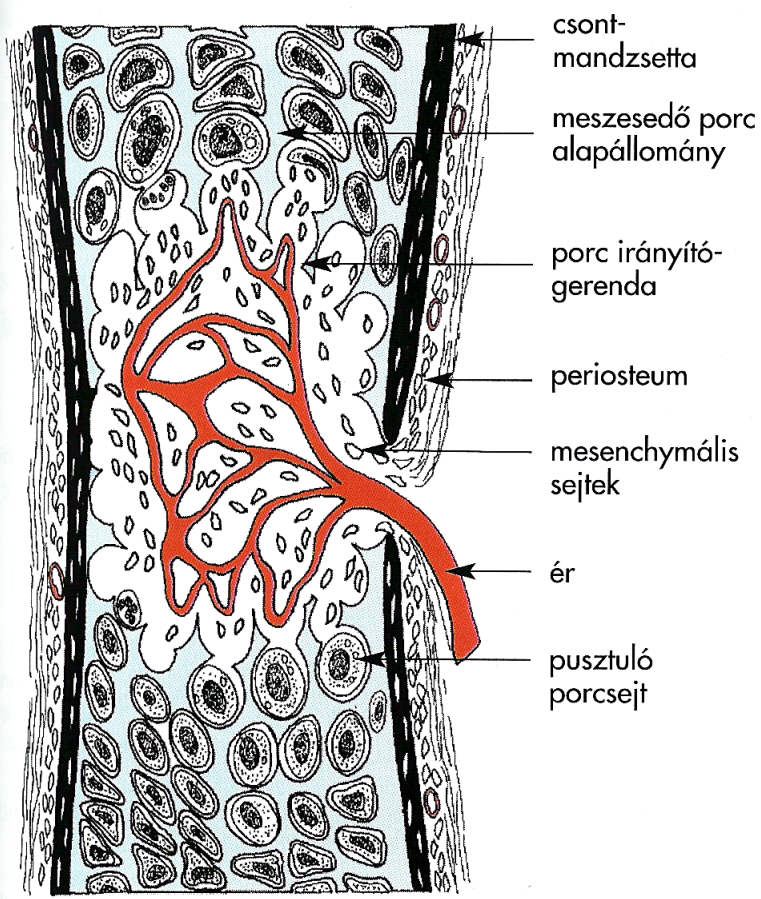
Chondrális csontosodás

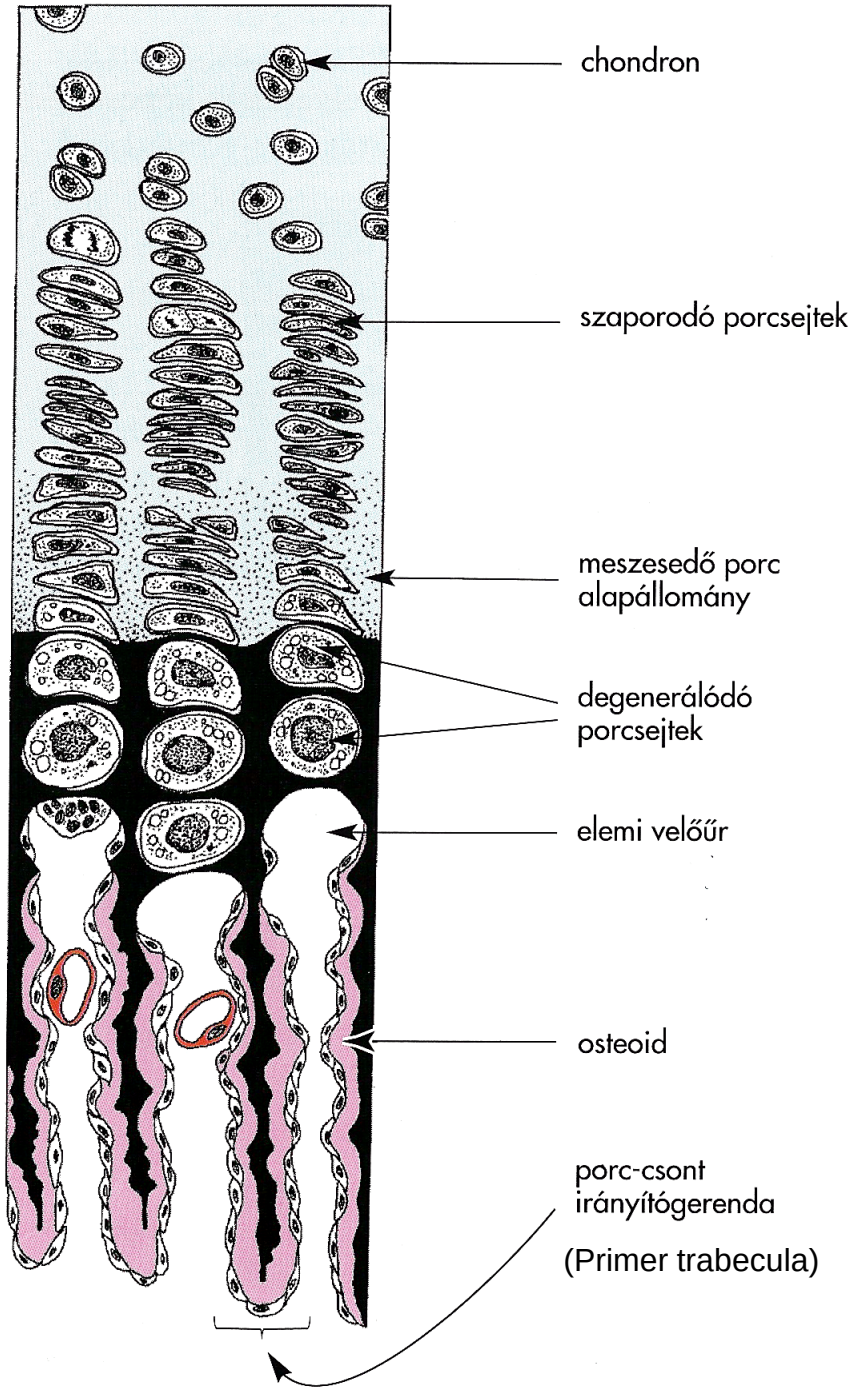


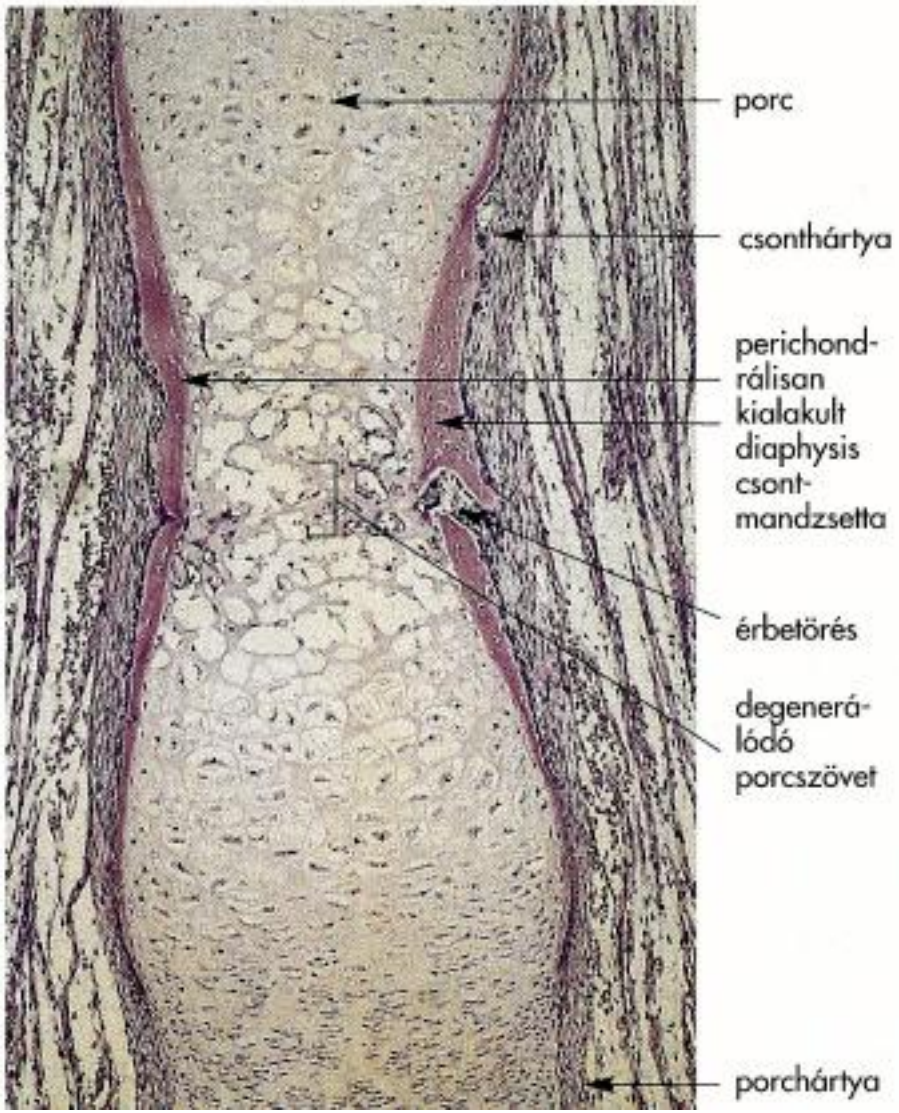
Perichondrális csontosodás

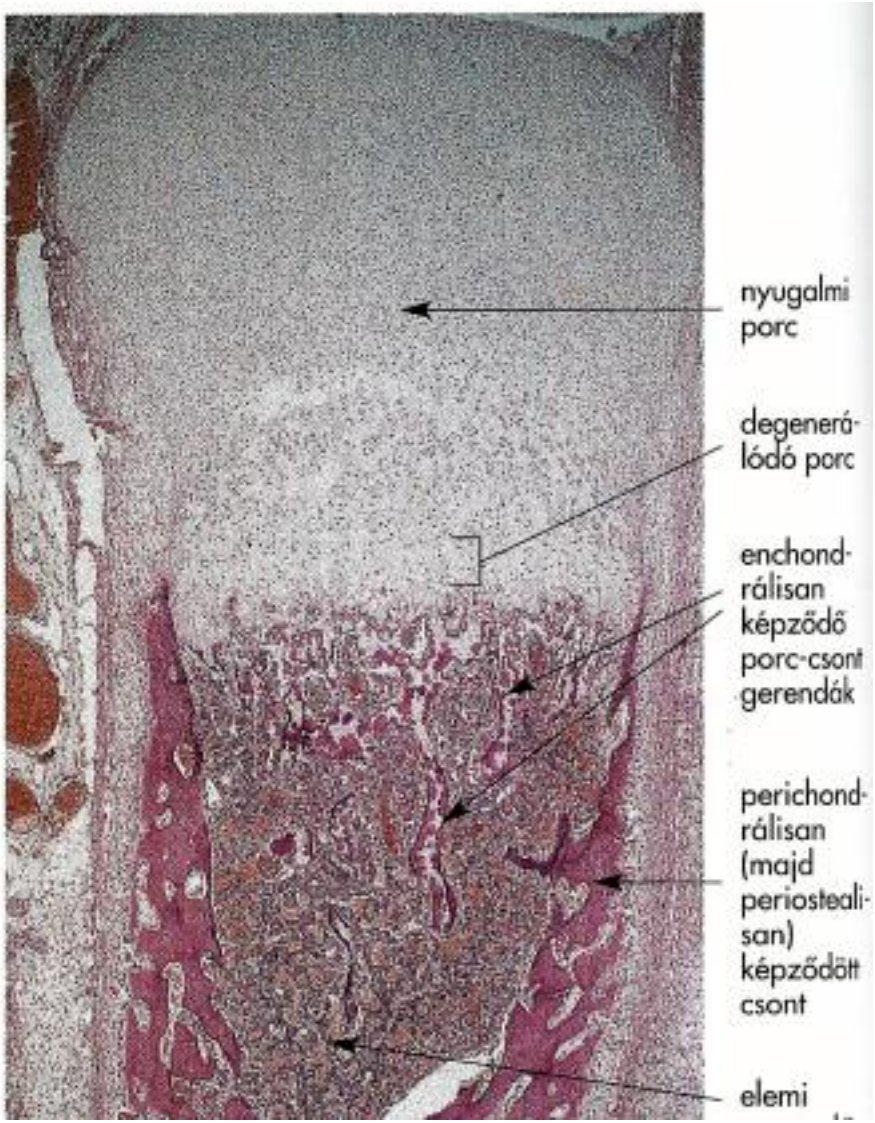
Primer csontosodási centrum
(enchondrális csontosodás)

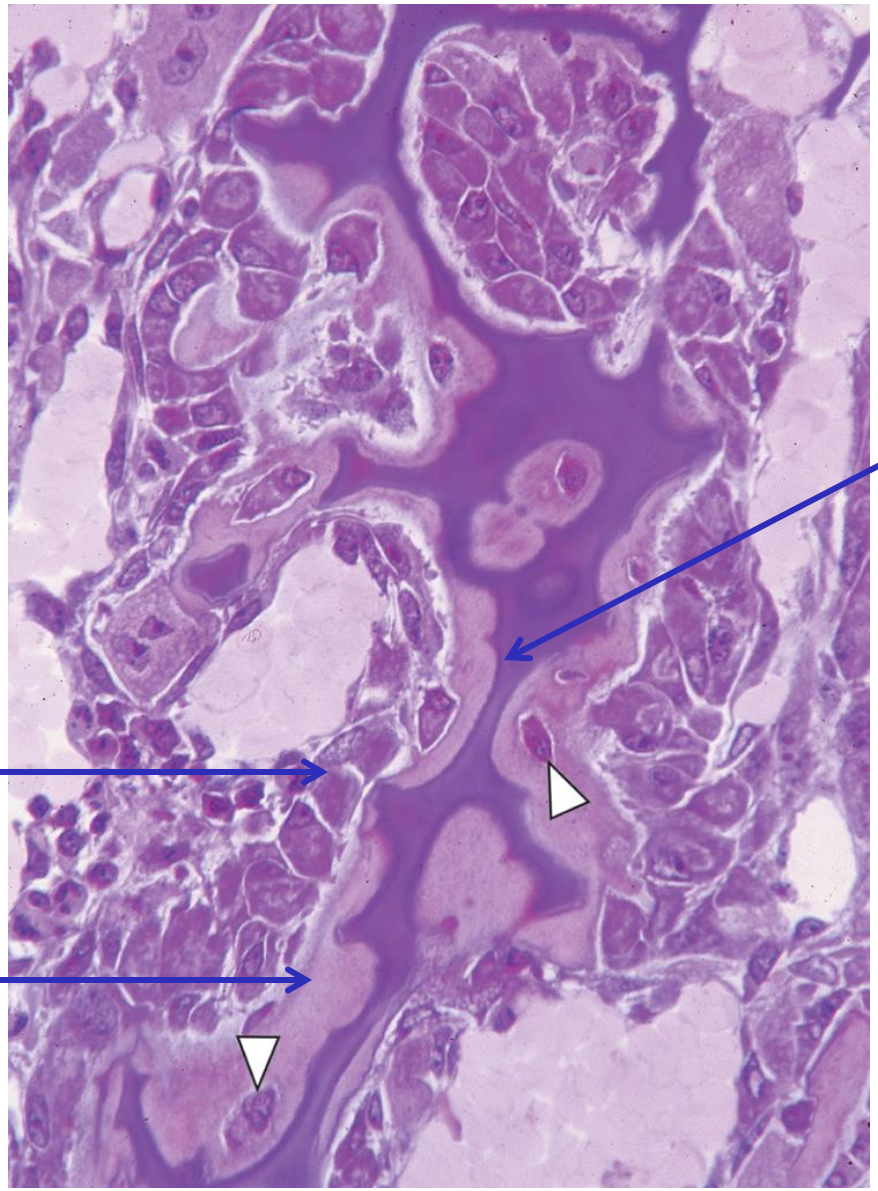
Secunder csontosodási centrum


csont-
mandzsetta
meszesedő porc
alapállomány
porc irányító-
gerenda
periosteum
mesenchymális
sejtek
ér
pusztuló
porcsejt

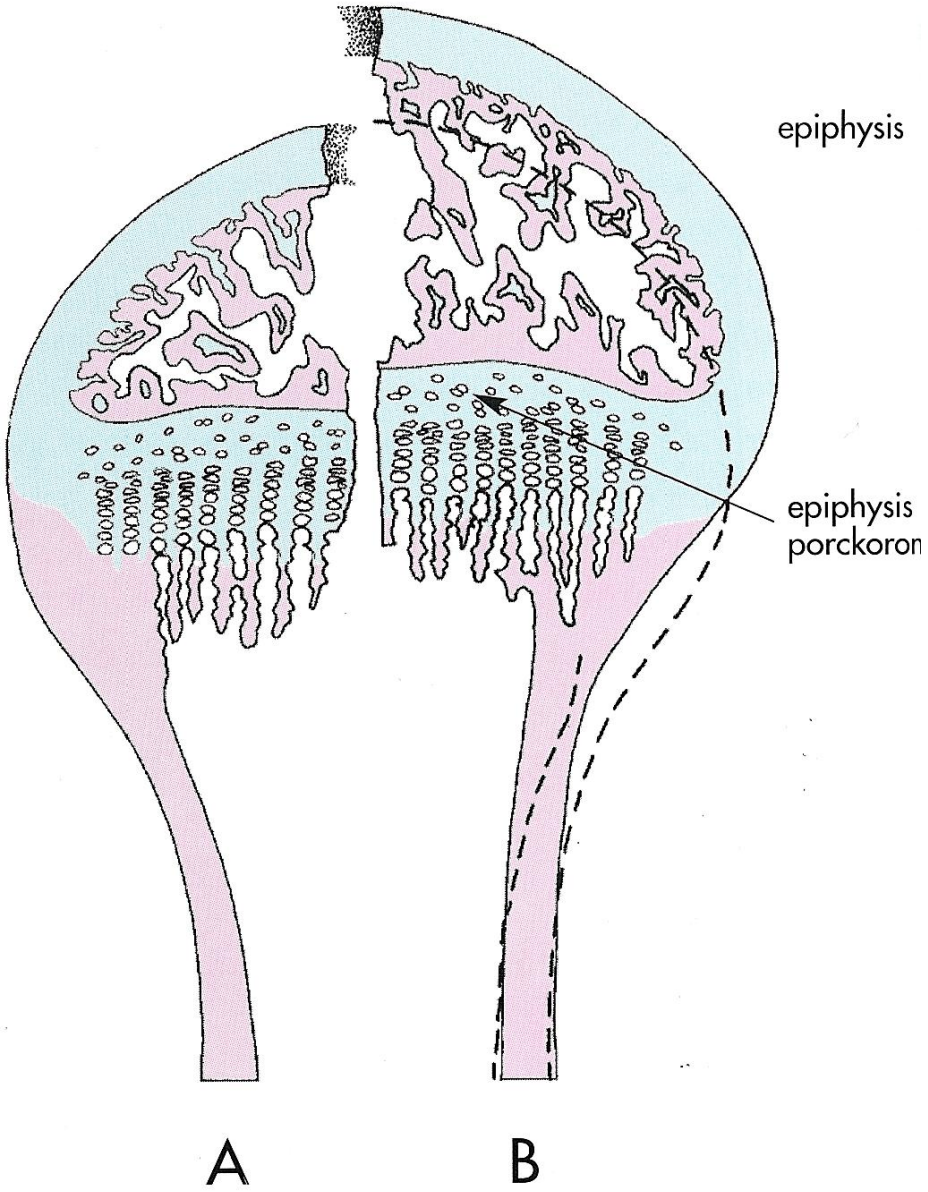

chondron
szaporodó porcsejtek
meszesedő porc
alapállomány
degenerálódó
porcsejtek
elemi velőűr
osteoid
porc-csont
irányítógerenda
(Primer trabecula)

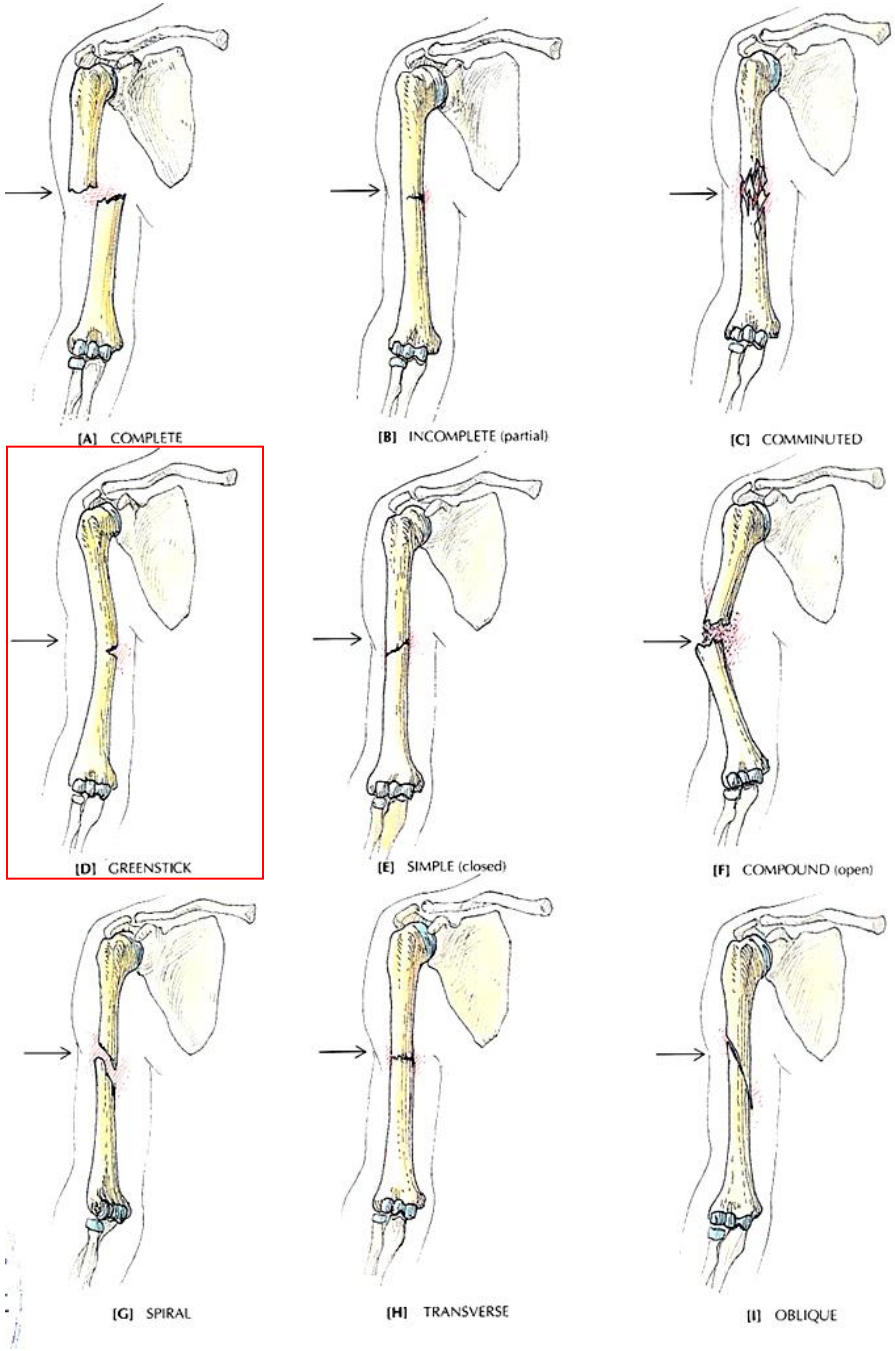

porc
csonthártya
perichond-
rálisan
kialakult
diaphysis
csont-
mandzsetta
érbetörés
degenerá-
lódó
porcszövet
porchártya

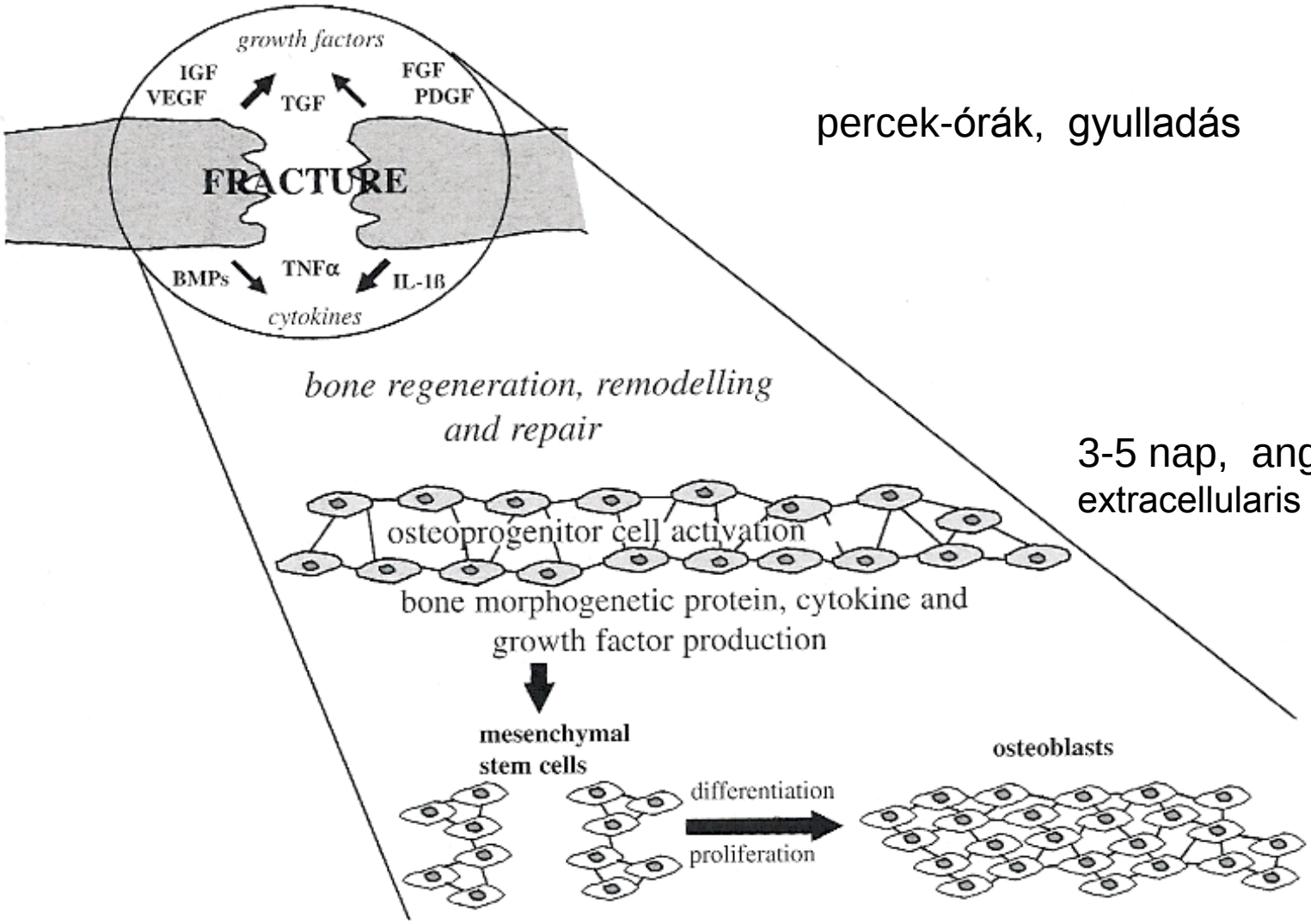

nyugalmi
porc
degenerá-
lódó porc
enchond-
rálisan
képződő
porc-csont
gerendák
perichond-
rálisan
(majd
periostealis-
san)
képződött
csont
elemi


irányítógerenda
osteoblast
Osteoid
(bone matrix)

Csont vastagodása és hossznövekedése




[A] COMPLETE
[B] INCOMPLETE (partial)
[C] COMMINUTED
[D] GREENSTICK
[E] SIMPLE (closed)
[F] COMPOUND (open)
[G] SPIRAL
[H] TRANSVERSE
[I] OBLIQUE

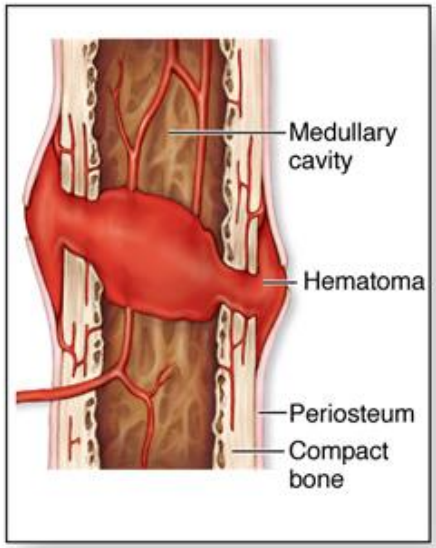


percek-órák, gyulladás

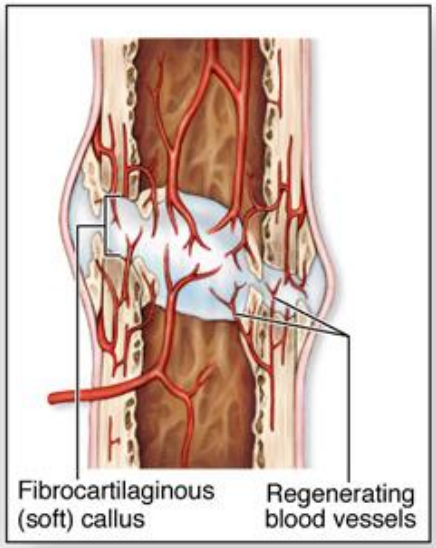
3-5 nap, angiogenesi
extracellularis matrix képzés

6-8 hét
csont képződés, átépülés

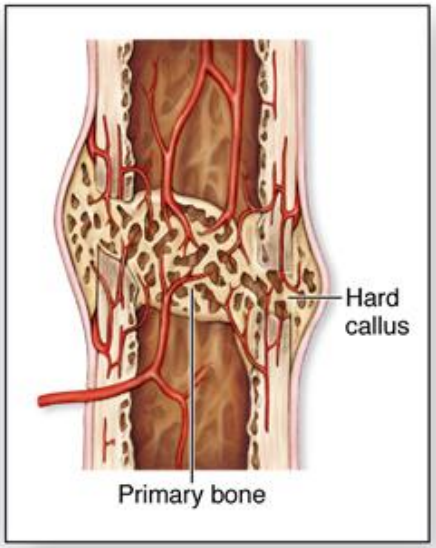
Csonttörés gyógyulása



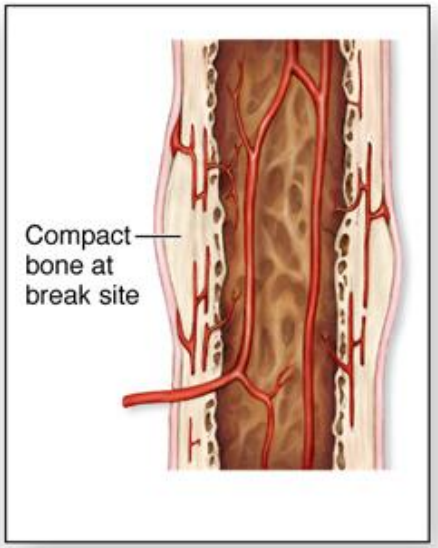
① Haematoma



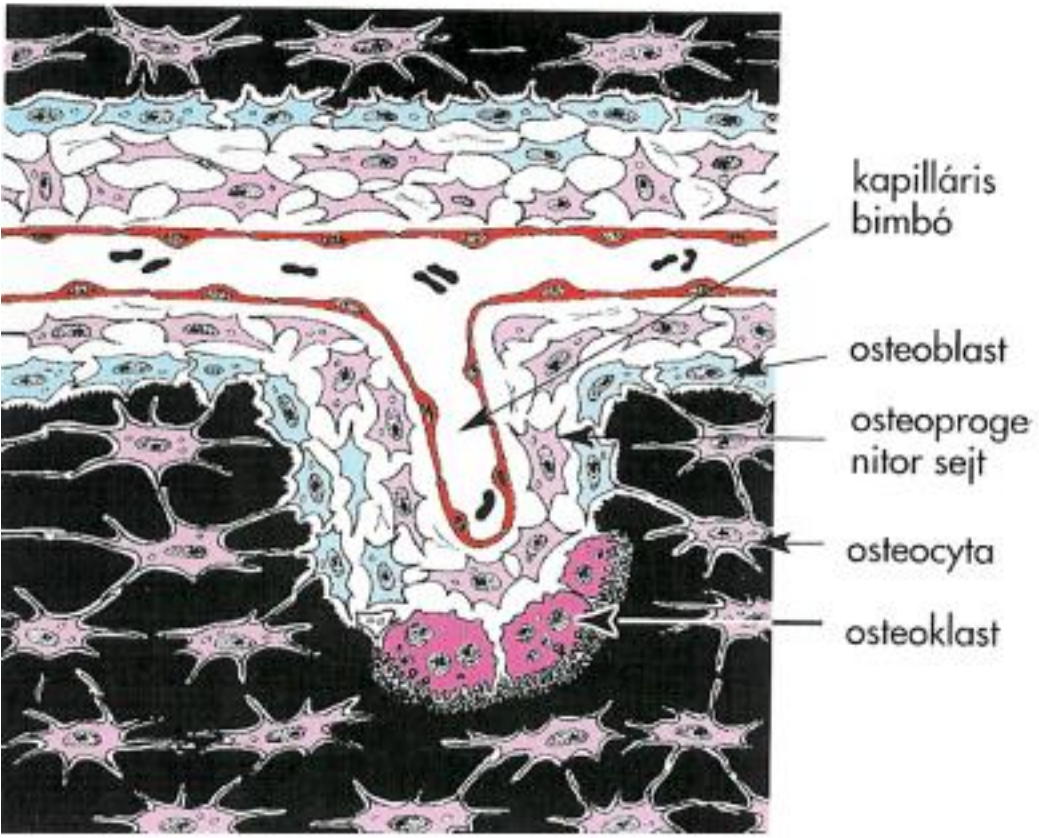
② Rostos porc (porcos callus)

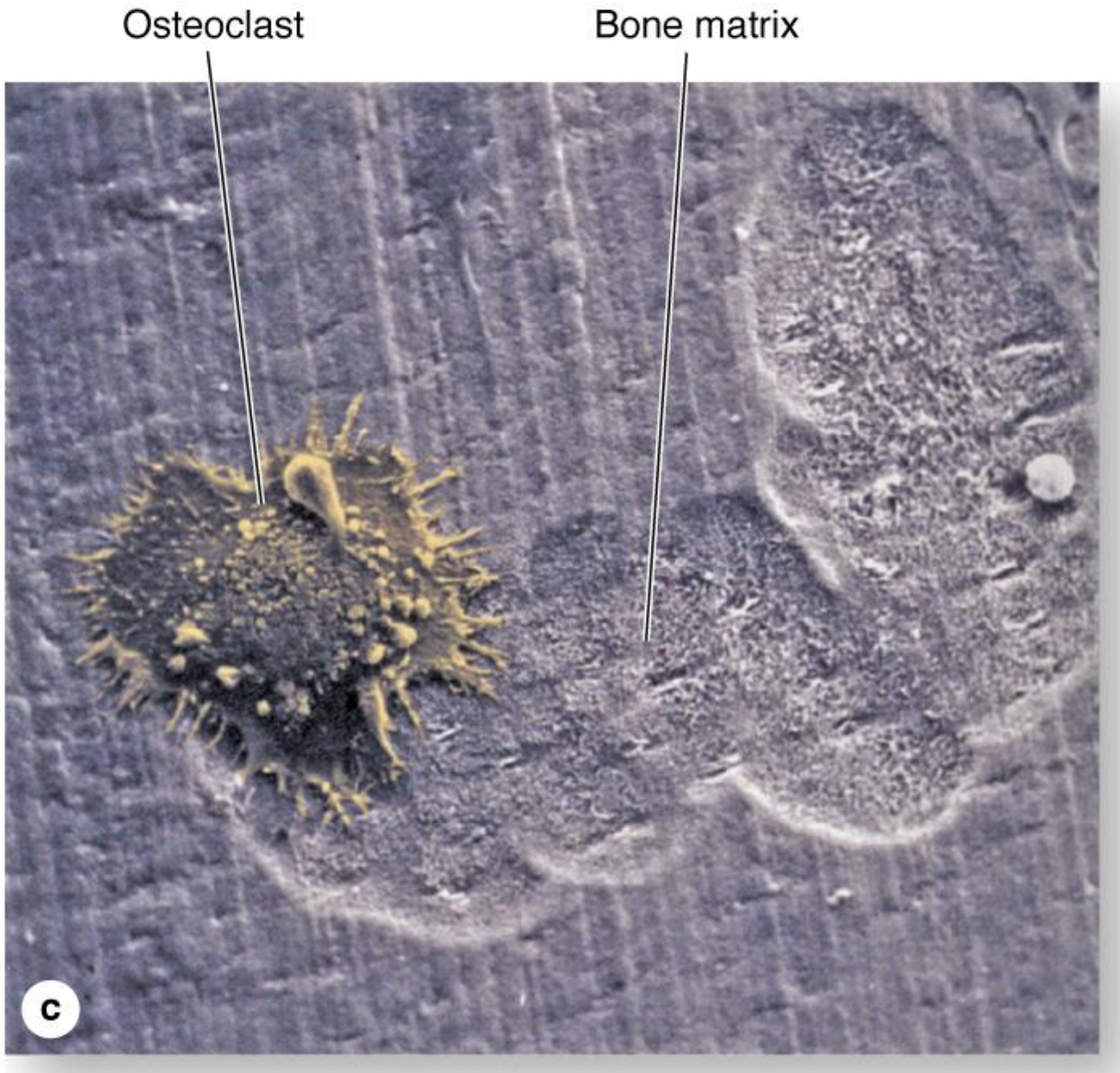


③ Csontos callus)

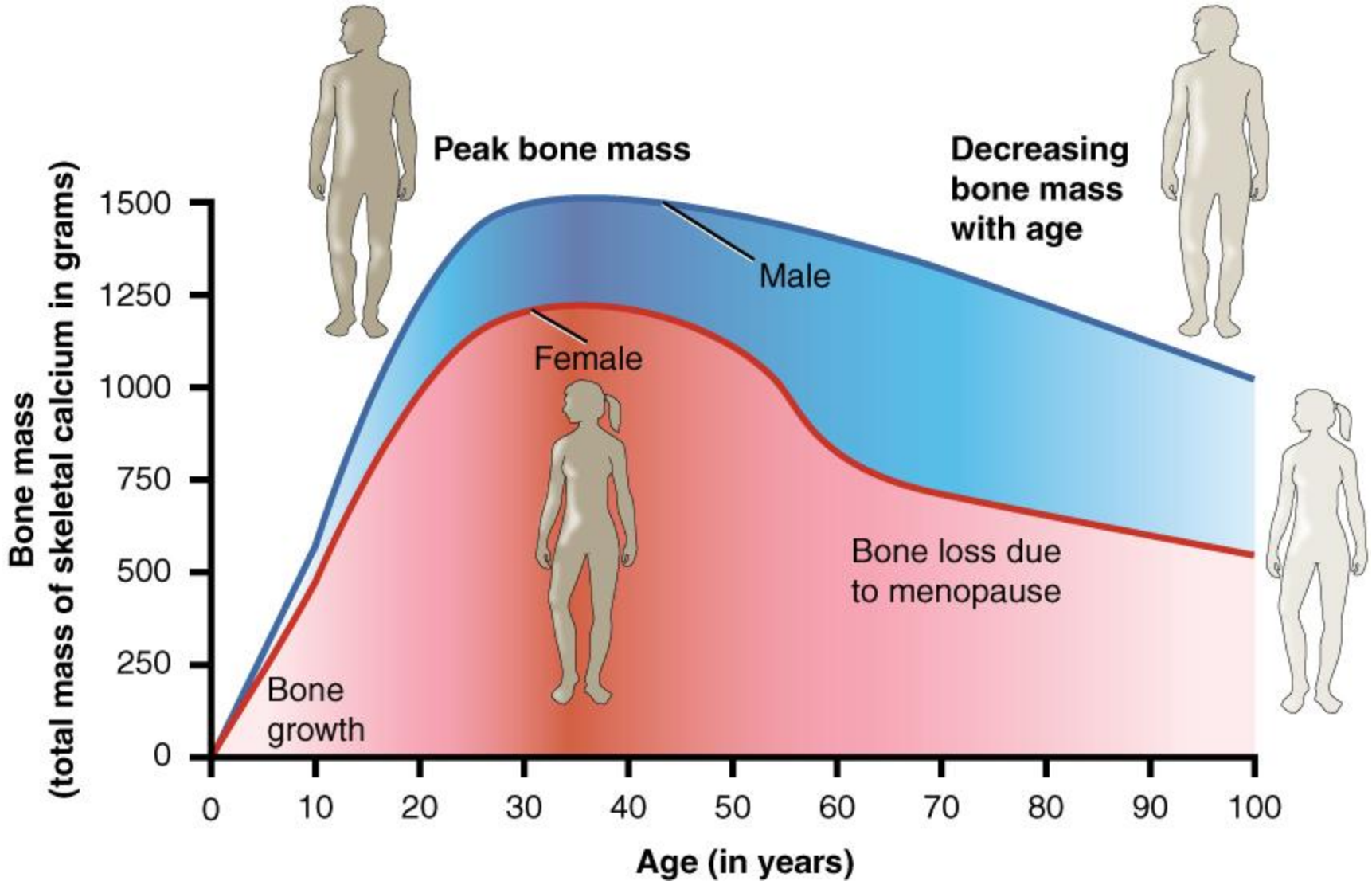


④ Csont átépülés


kapilláris bimbó
osteoblast
osteoproge nitor sejt
osteocyta
osteoklast


Osteoclast
Bone matrix
c

osteoporosis



Osteomalacia

Osteomalacia:

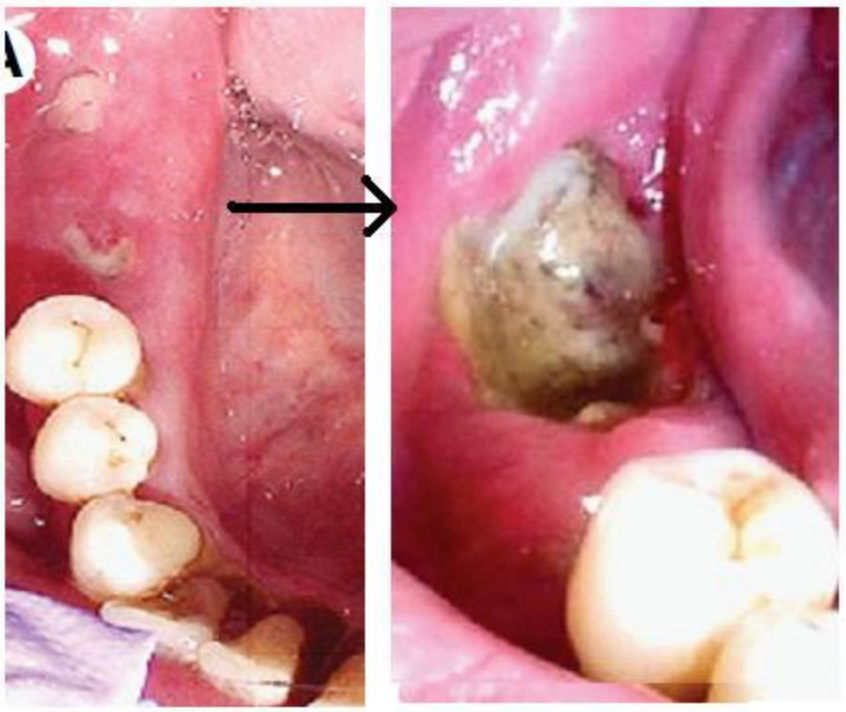
Csontlágyulás,
osteoid szövet elégtelen mineralizációja

gyermekkorban jelentkező: rachitis (angolkór),

D-vitamin különböző eredetű hiánya

osteitis deformans (Paget-kór)

Bisphosphonát: osteoclast apoptosis



Csontpótlás

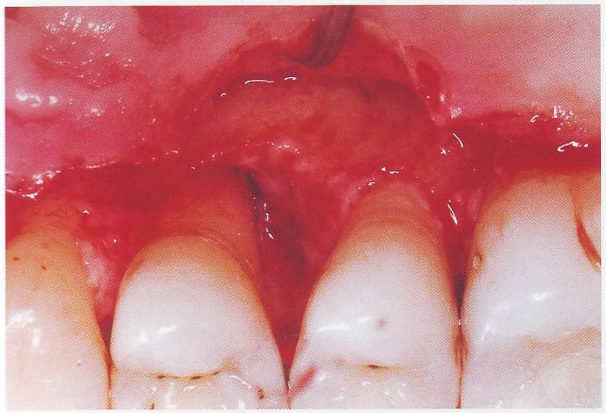
A csontpótlásban megkülönböztetünk
oszteogén (általában oszteogén őssejtet tartalmazó),

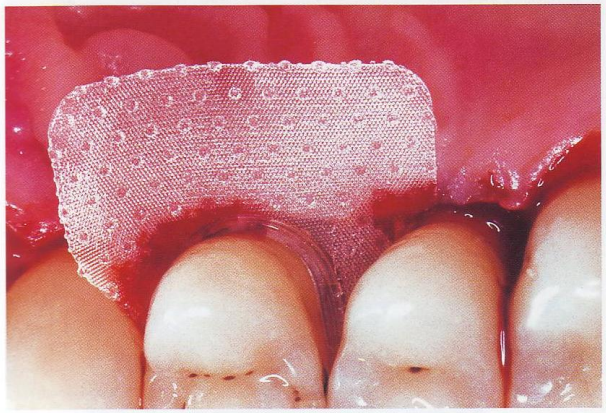
oszteoinduktív (mesenhymális őssejtet oszteogén differenciálódásra „bíró”) és

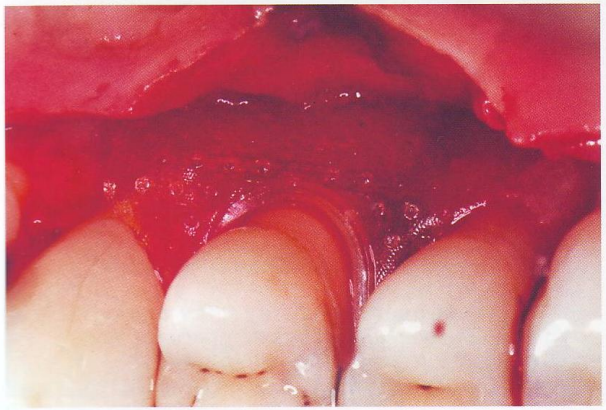
oszteokonduktív (az újcsontképződést fizikailag támogató) tulajdonságokat.

Autograft, isograft
Allograft
Xenograft

GTR technika



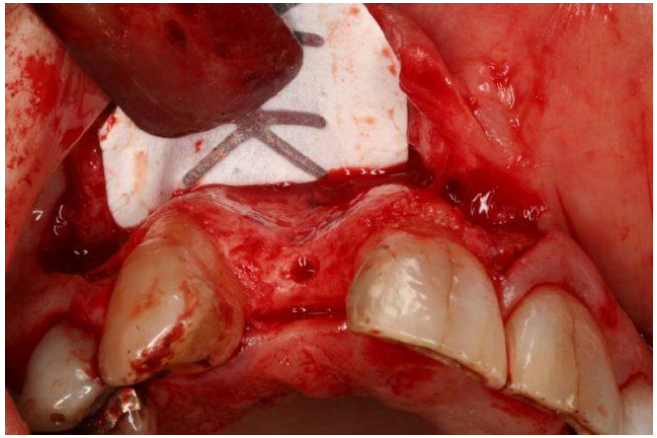


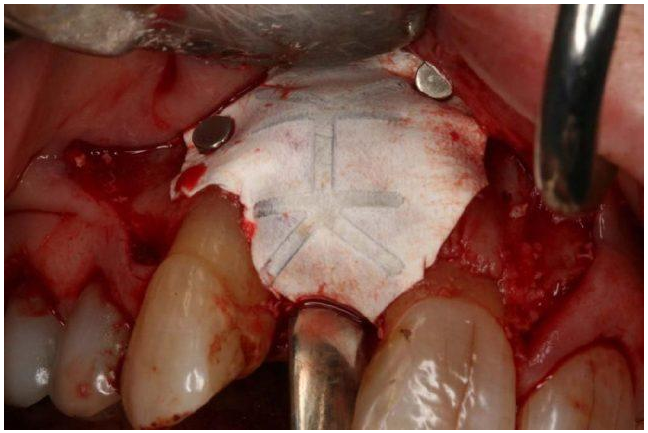


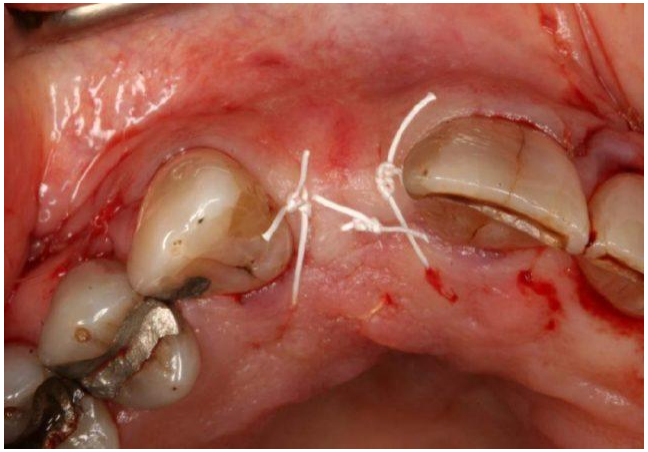
The case six months after the operation.

erative X-ray: *e defect on the e of the second premolar.*

erative X-ray: *year): note the egeneration of ne bone defect.*

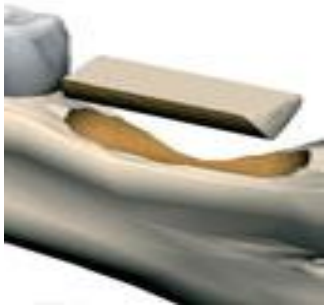
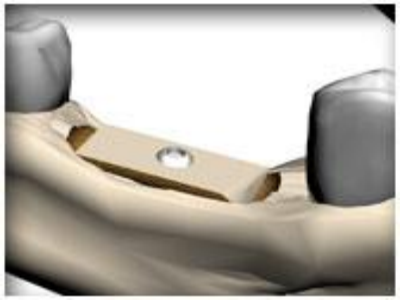




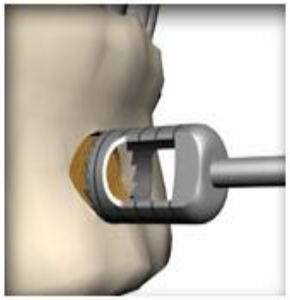


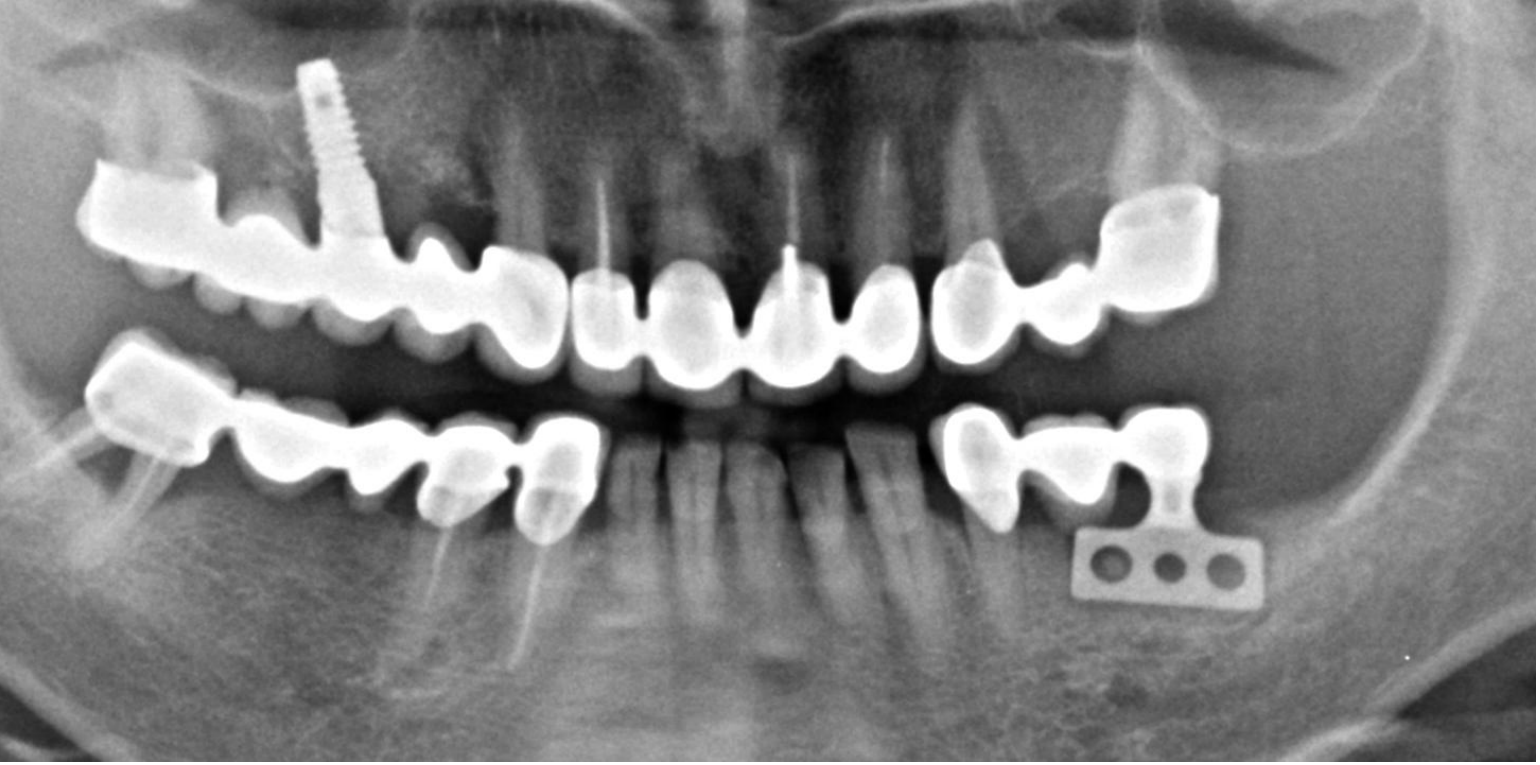
Amr Bokhari, DDS MPH

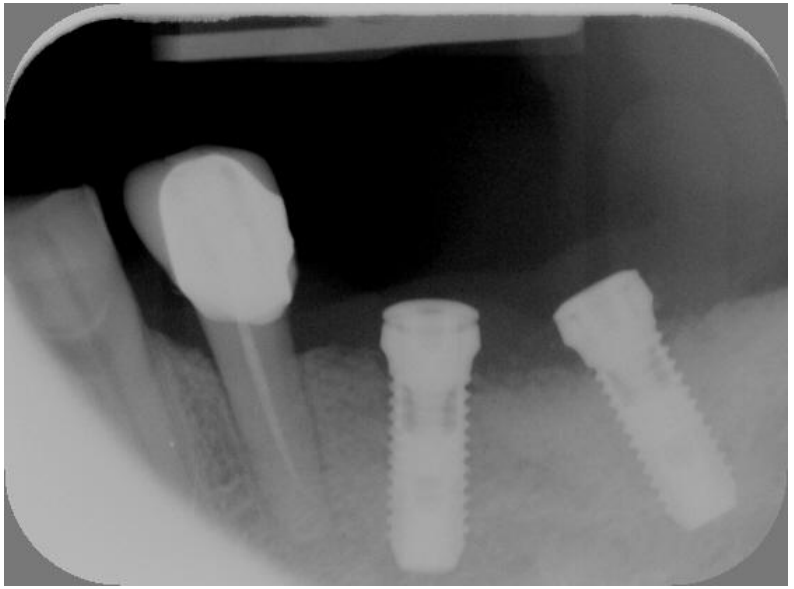


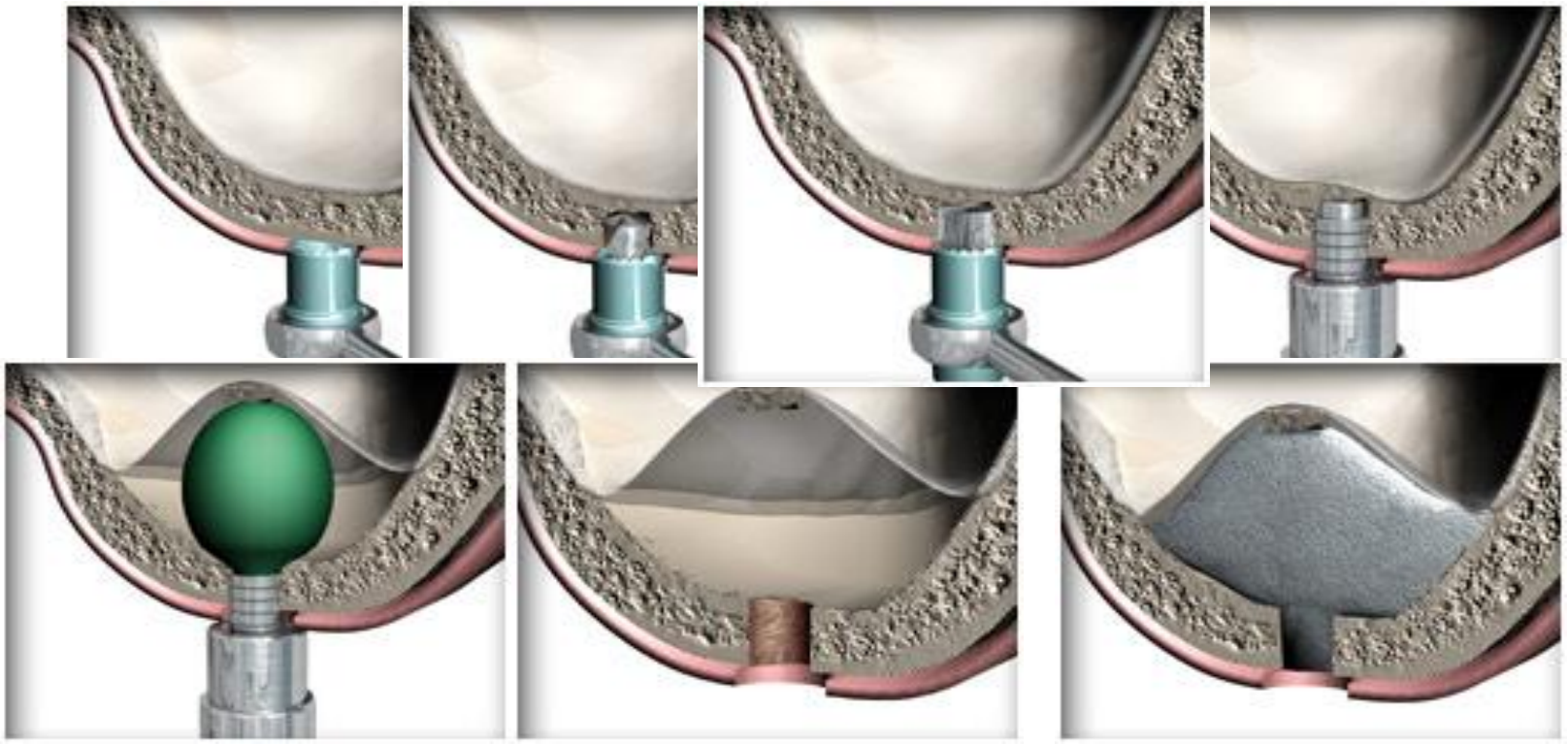




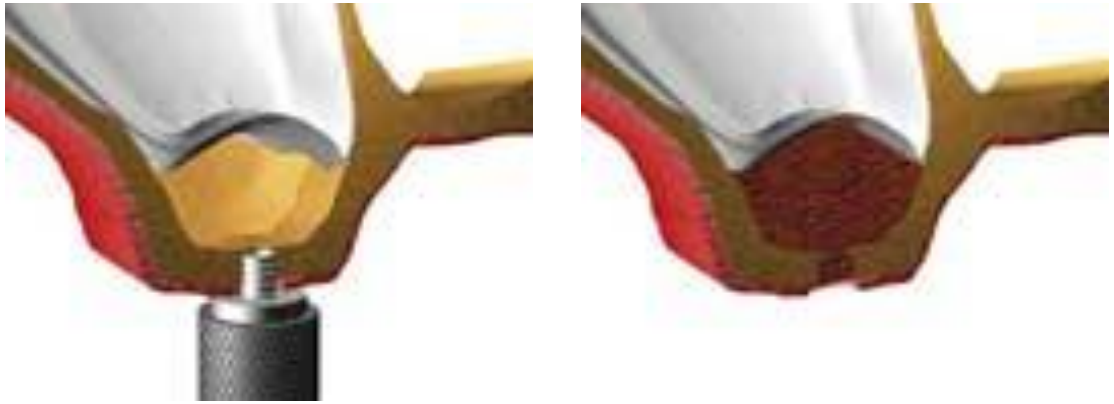








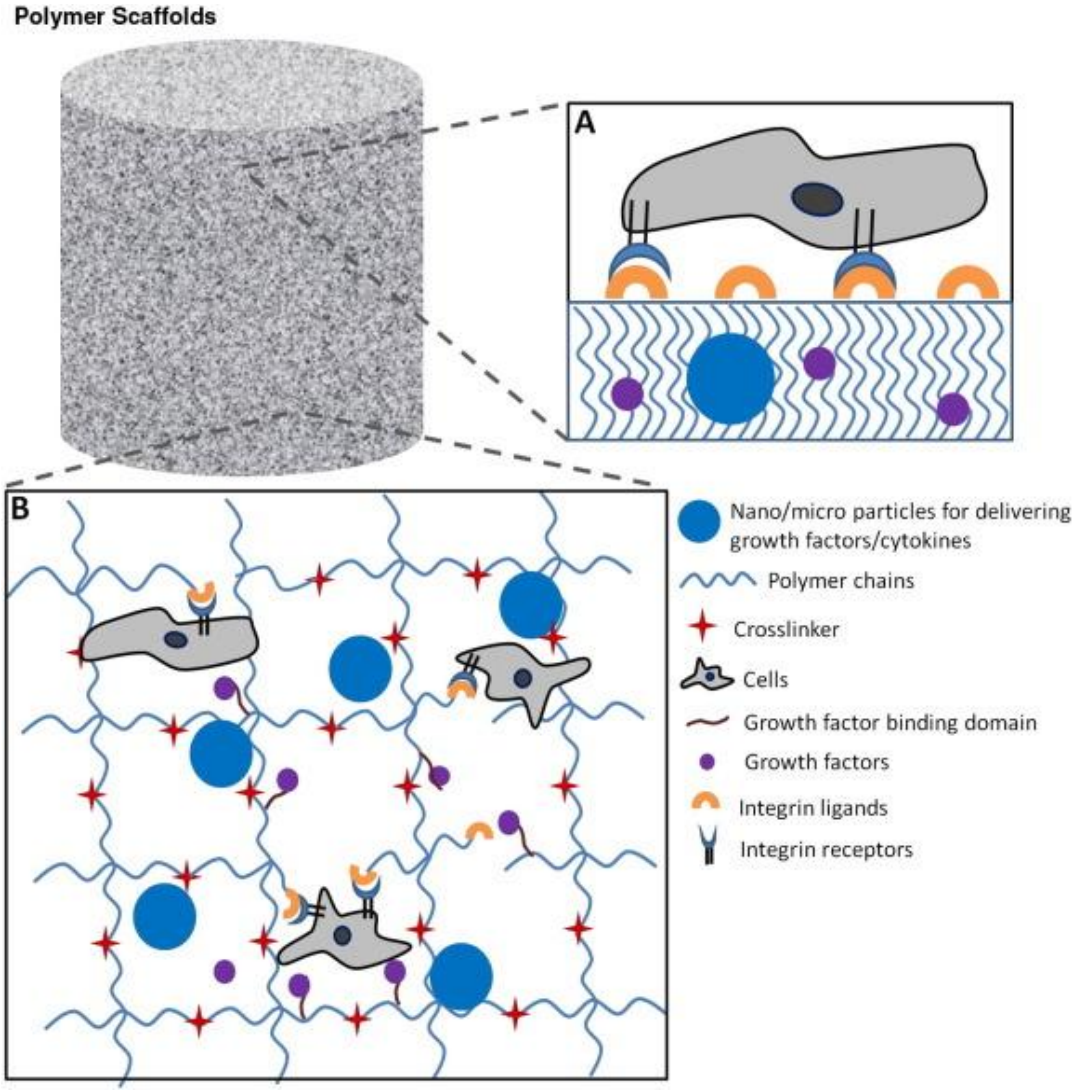
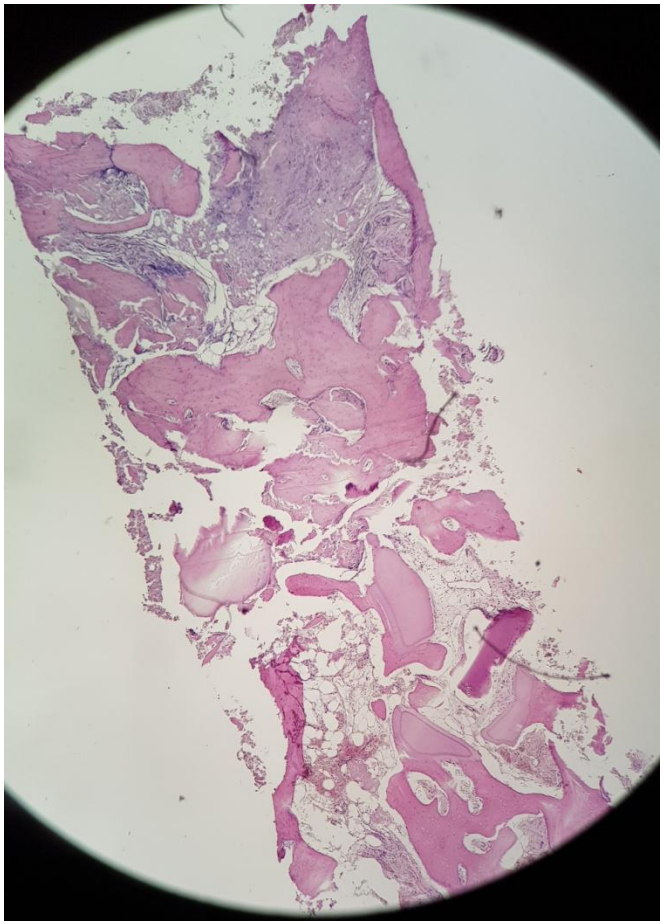
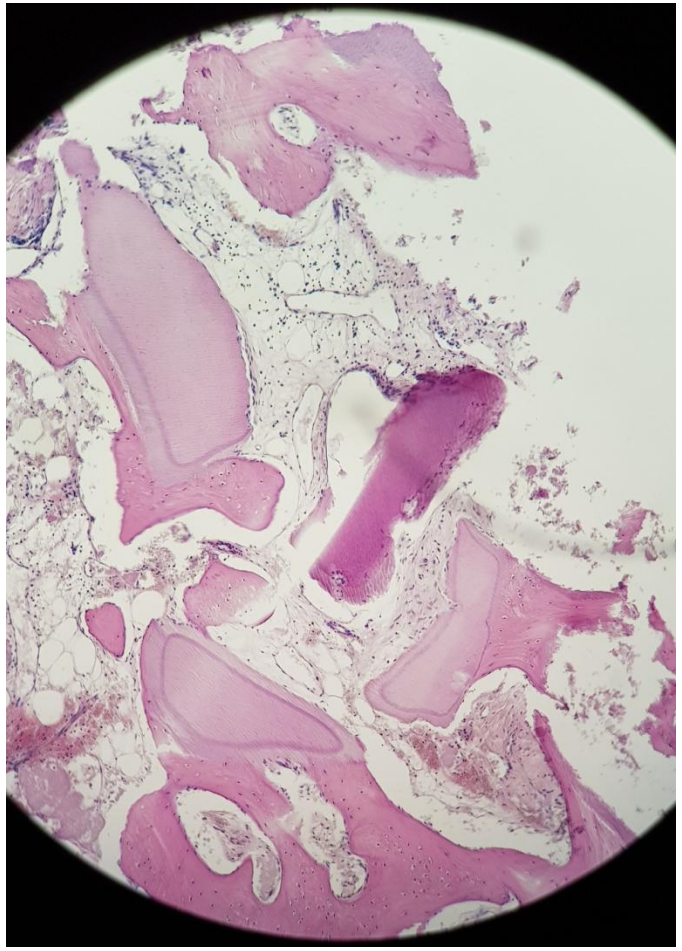


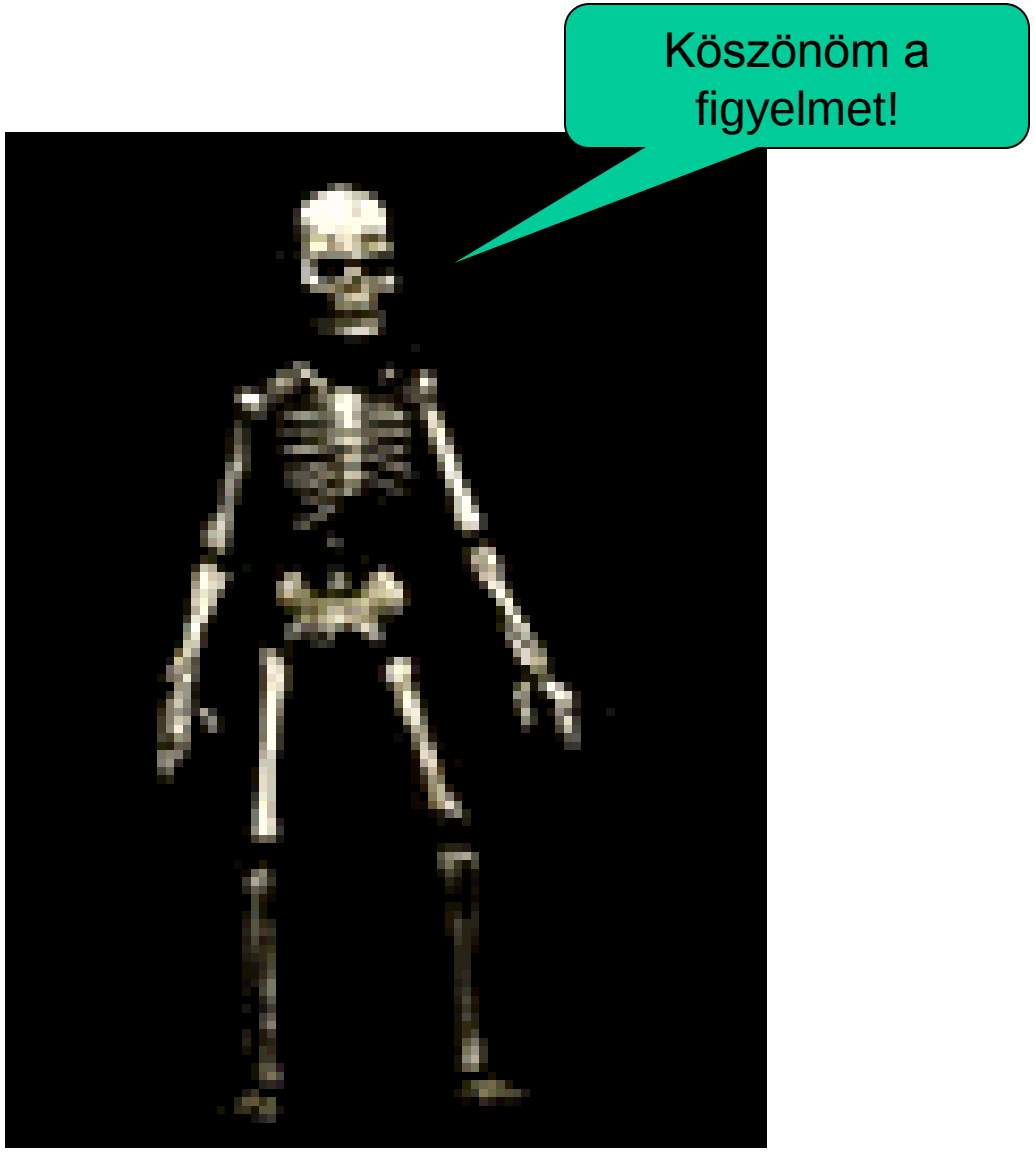
Fig. 2. Polymer implants for bone tissue engineering. A) Solid polymer surfaces or porous scaffolds can be adsorbed with integrin ligands for cell attachment for bone regeneration. Various growth factors can also be encapsulated during the fabrication process....

Rachit Agarwal, Andrés J. García
Biomaterial strategies for engineering implants for enhanced osseointegration and bone repair ☆
Advanced Drug Delivery Reviews, Volume 94, 2015, 53–62

http://dx.doi.org/10.1016/j.addr.2015.03.013






Köszönöm a figyelmet!