Radiology for stomatologists

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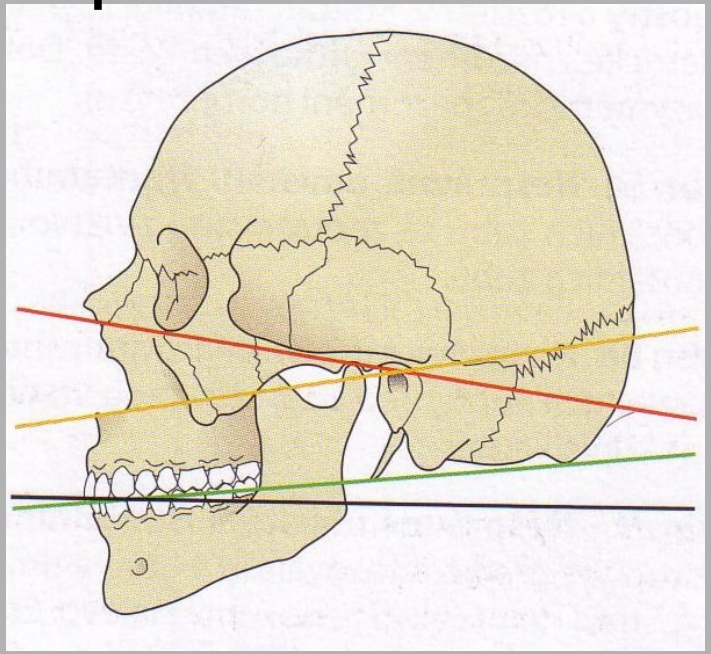
Radiograms

- Extraoral skiagrams (X-ray pictures)
  - Cranium
  - Focus on separate regions of the cranium
  - Orthopantomogram (OPG)
- Intraoral skiagrams

Projections and Anatomy

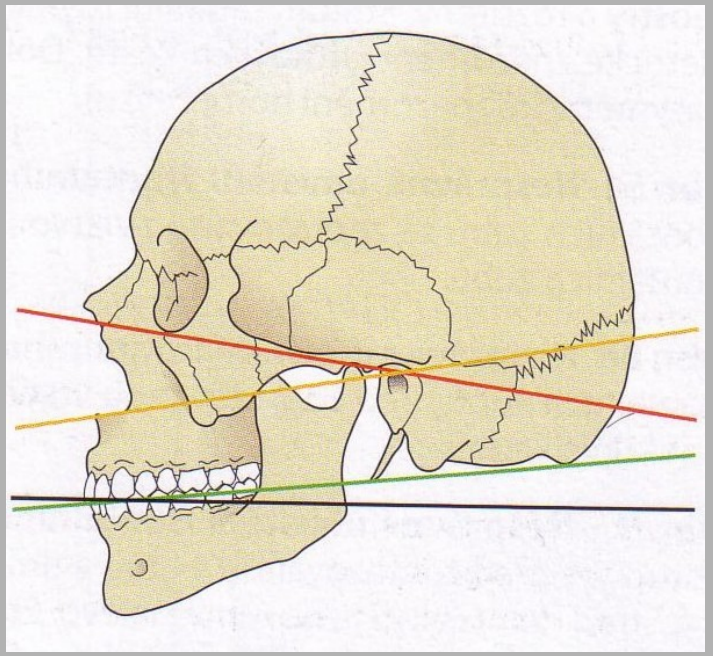
Lendmark lines

- ***Frankfurt´s*** horizontal, antropological basic plane, connects caudal part of obrit to external auditory meatus.
- ***Camper´s*** plane connects the external auditory meatus to caudal part of nose.



Lendmark lines

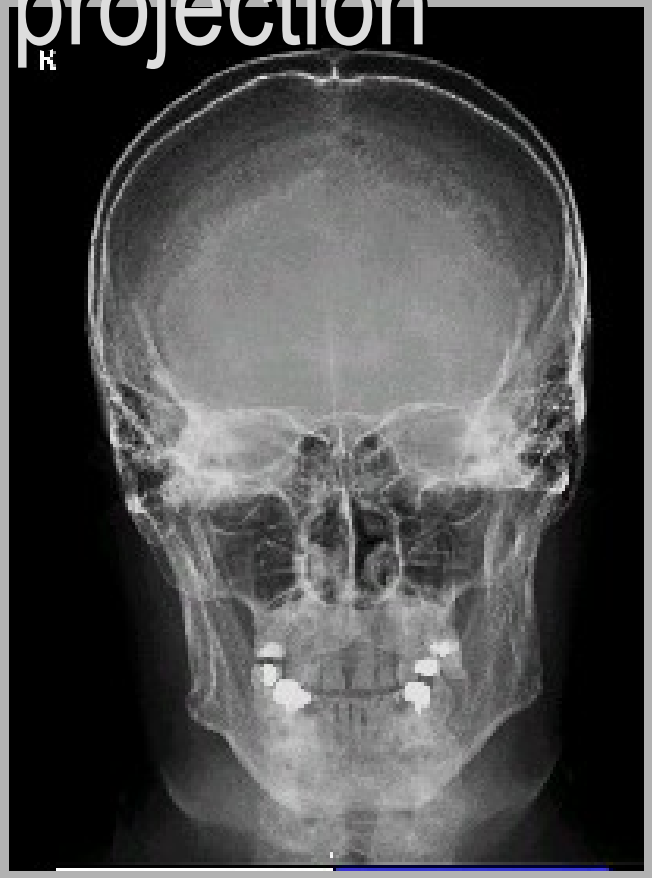
- ***Occlusal*** plane should be horizontally (black line) oriented or slightly inclined down (at small children).

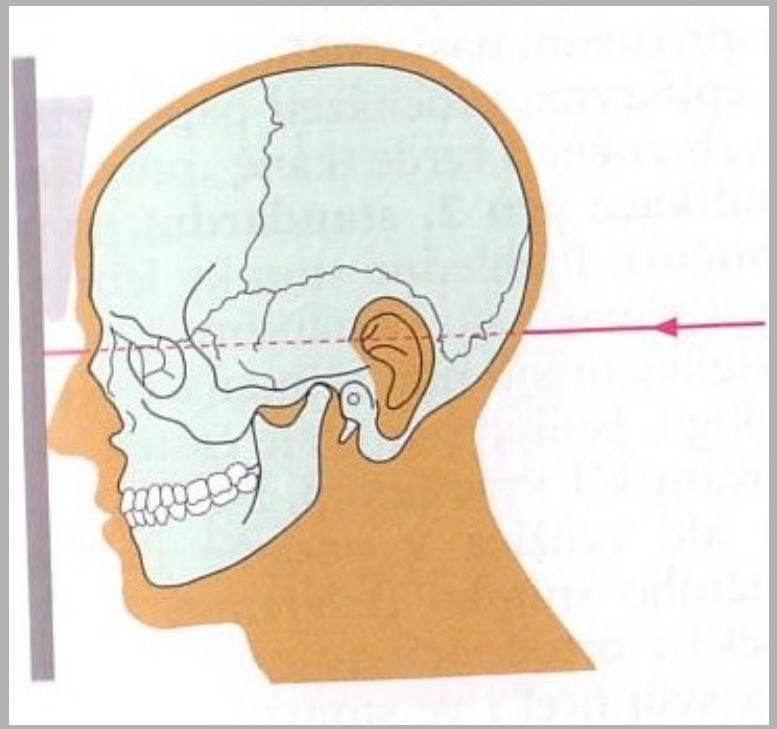


Extraoral skiagrams

- Panoramic:
  - Picture of the cranium
  - Projection of the maxillar sinus
  - TMJ – Temporo-Mandibular Joint
  - Orthopantomogram (OPG)
- Tomography (CT, MRI)
  - Film or detector is placed out of the patient mouth.
  - Image of larger surface of mandibula, maxilla, soft tissues and the cranium.

Cranium – dorso-ventral and lateral projection

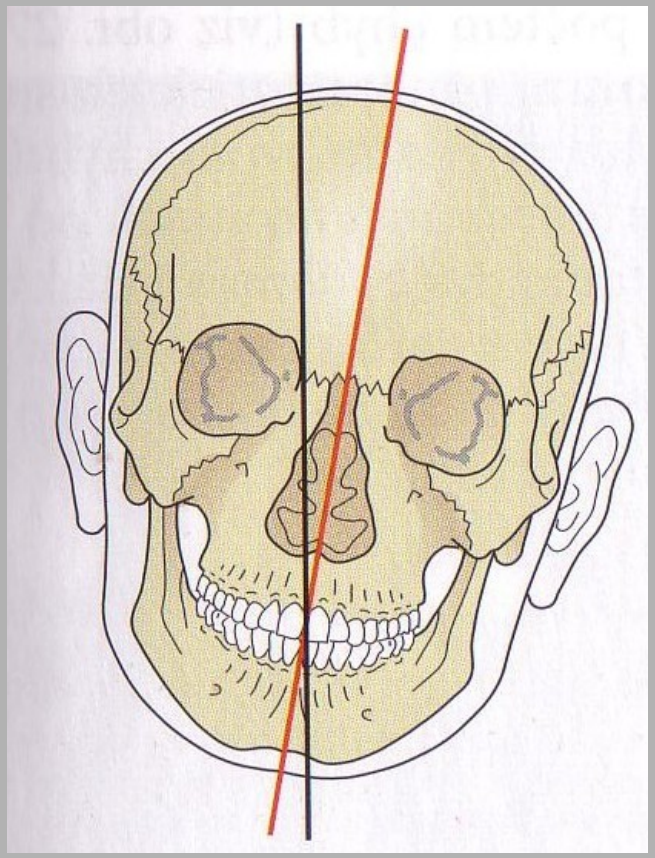


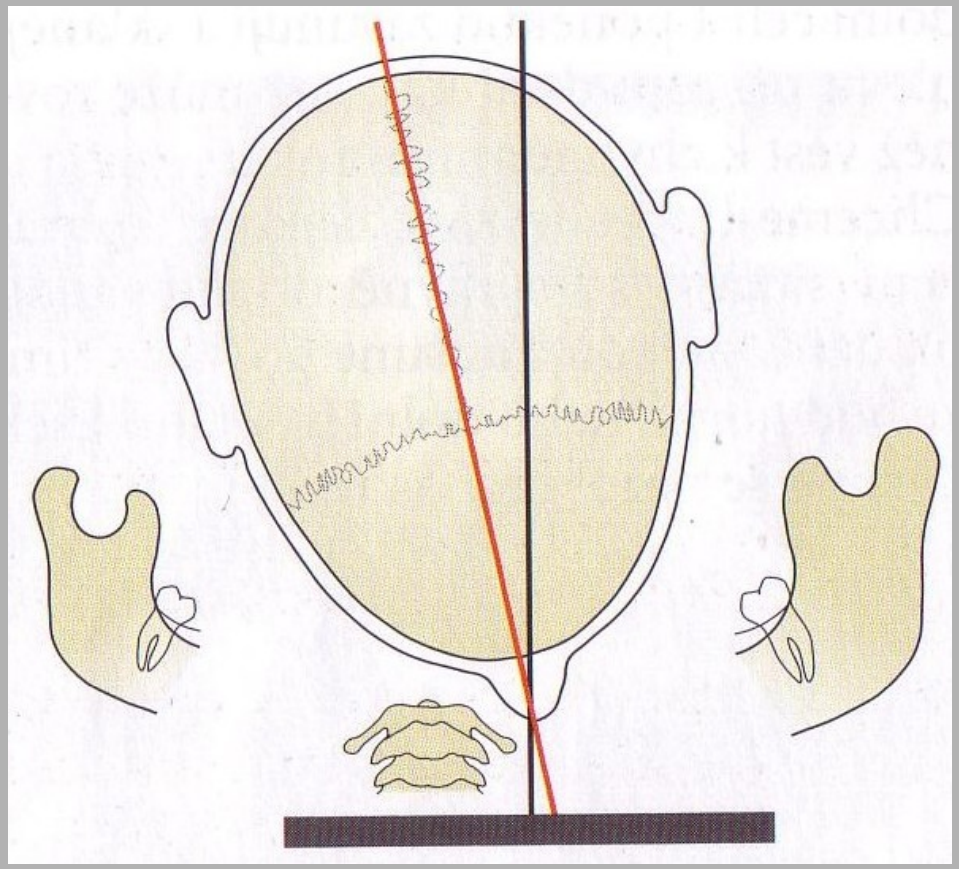


- Nose and forehead touch the cassette.
- X-ray pass through the protuber. occipitalis perpendicularly to cassete.

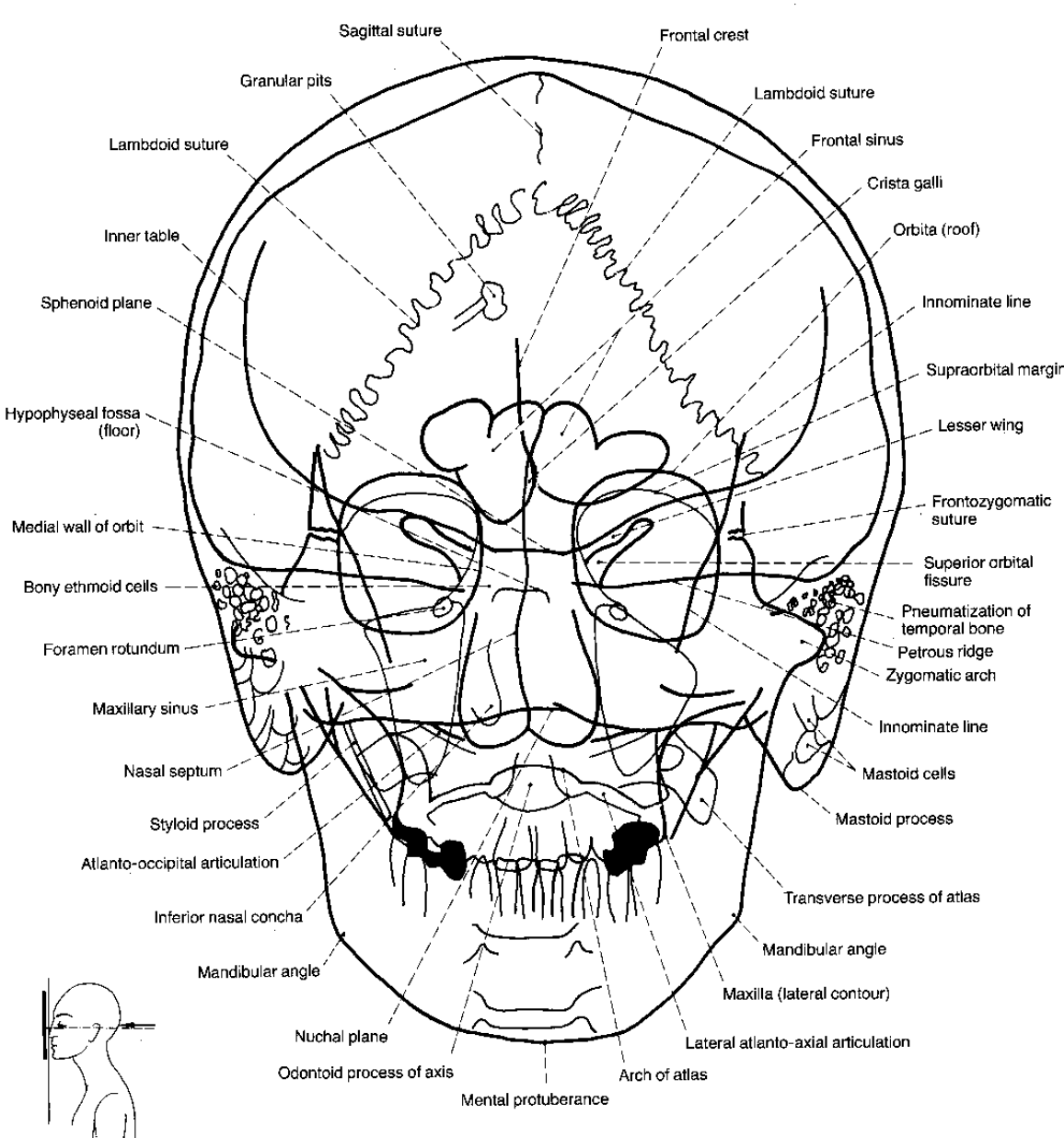
Cranium – dorso-ventral and lateral projection

- Centre
- Tilting,etc.

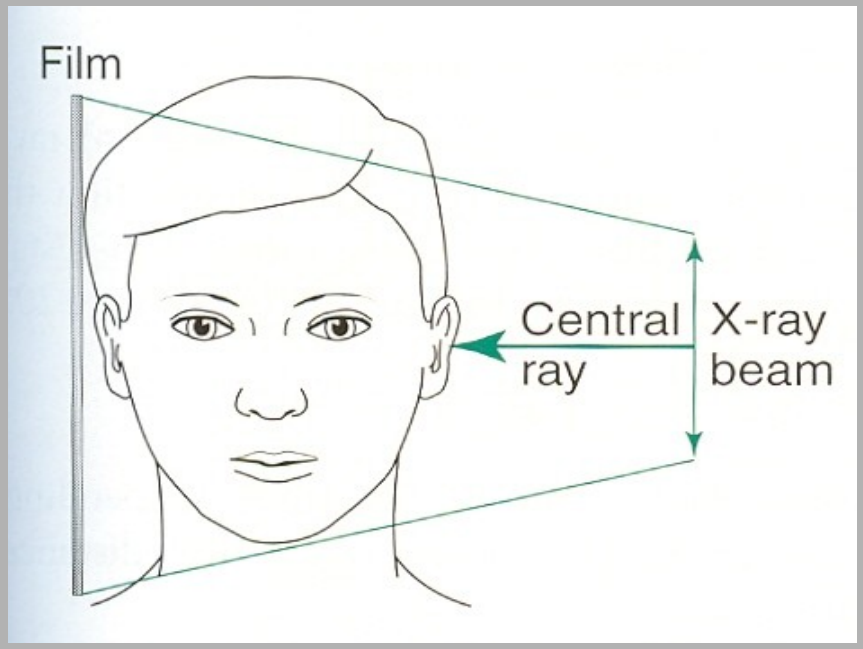




Cranium – dorso-ventral and lateral projection

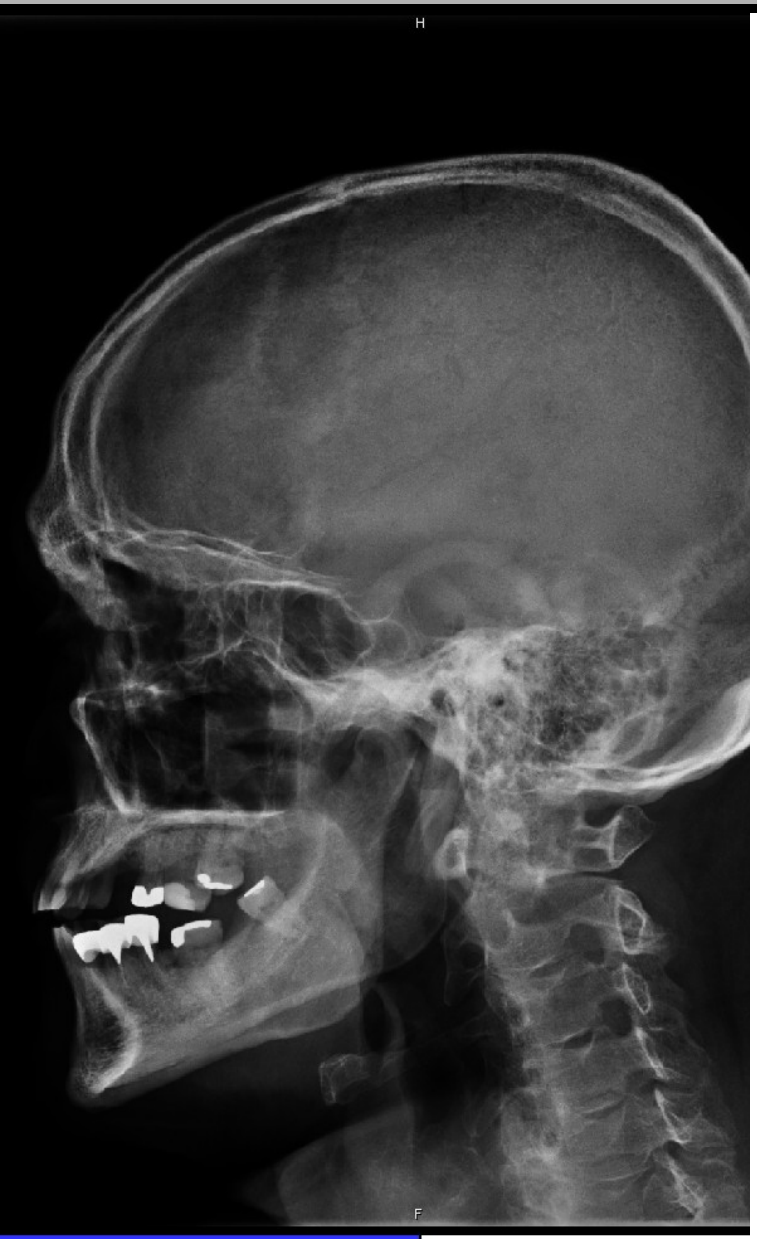


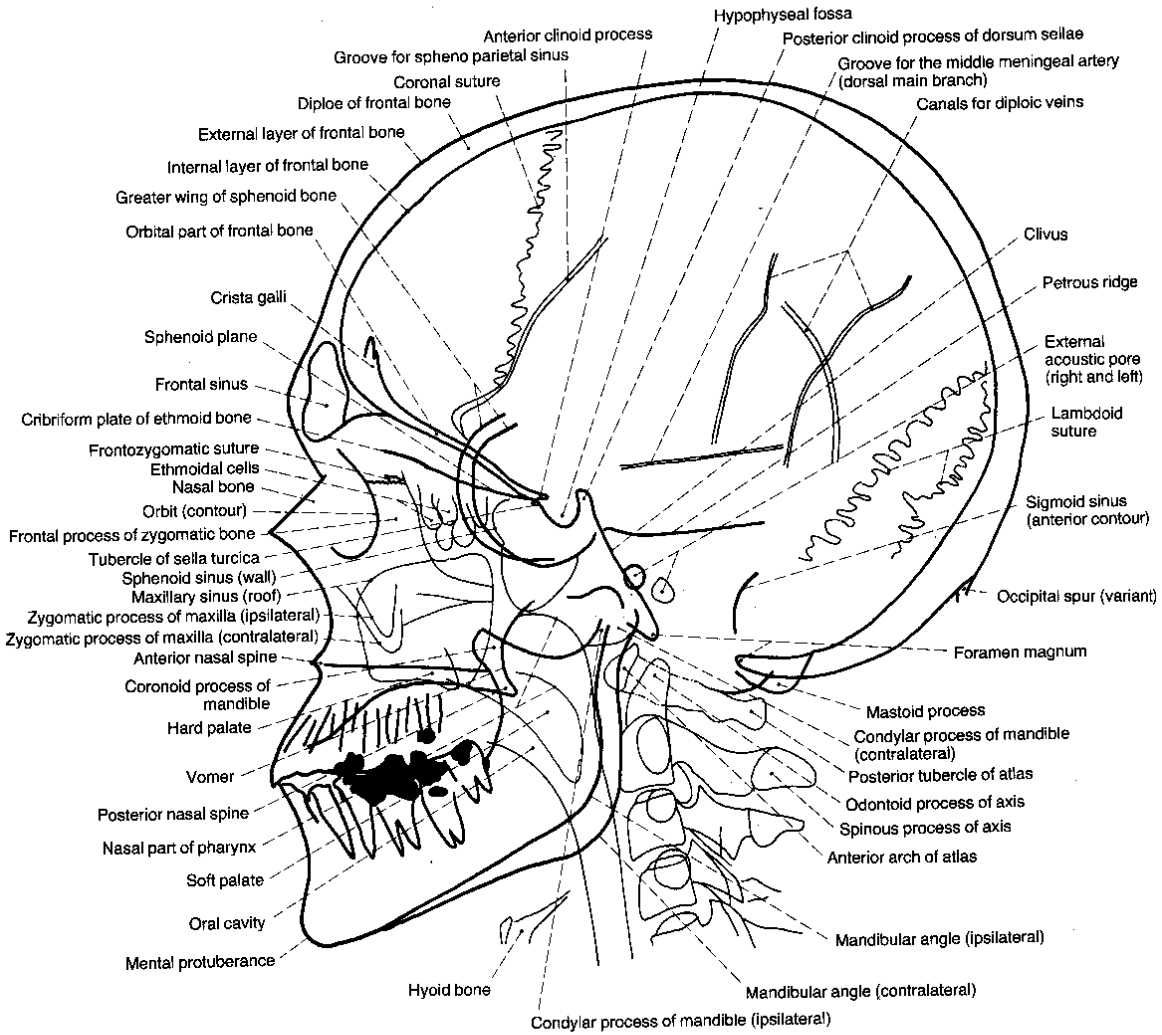
Cranium – lateral projection

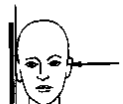


- Central beam goes through the acustic meatus
- Perpendicular to the cassette

Cranium – lateral projection

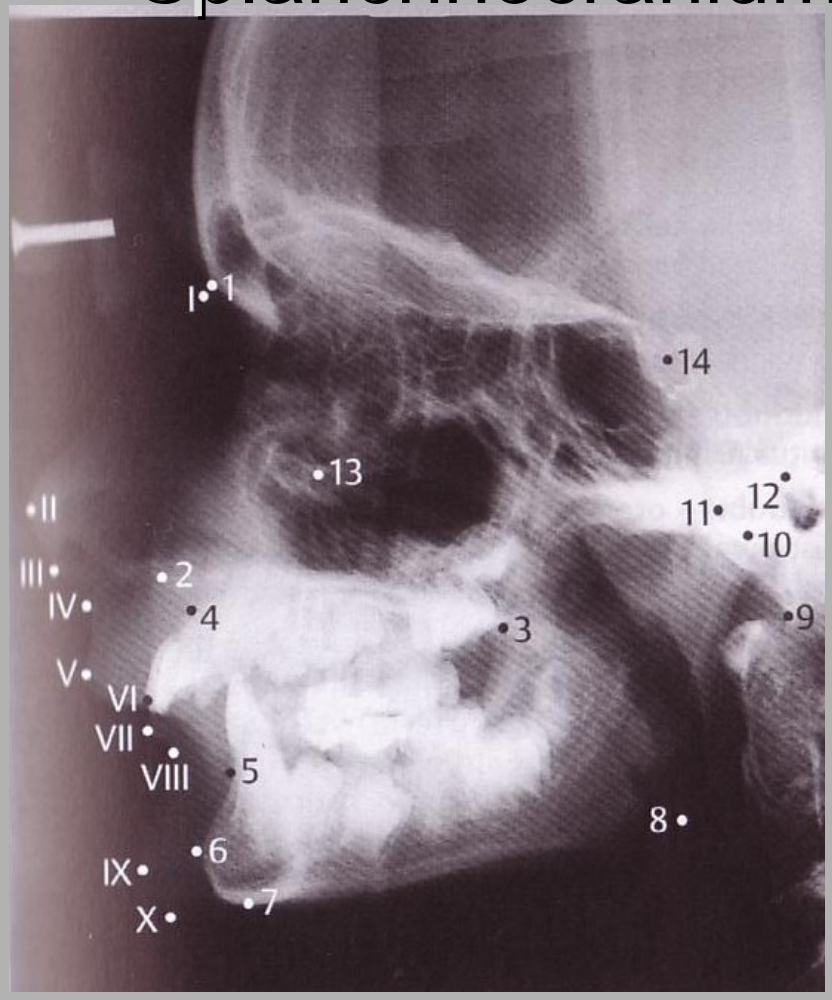






Cranium – lateral projection

- Splanchnocranium centre



Skeleton Points

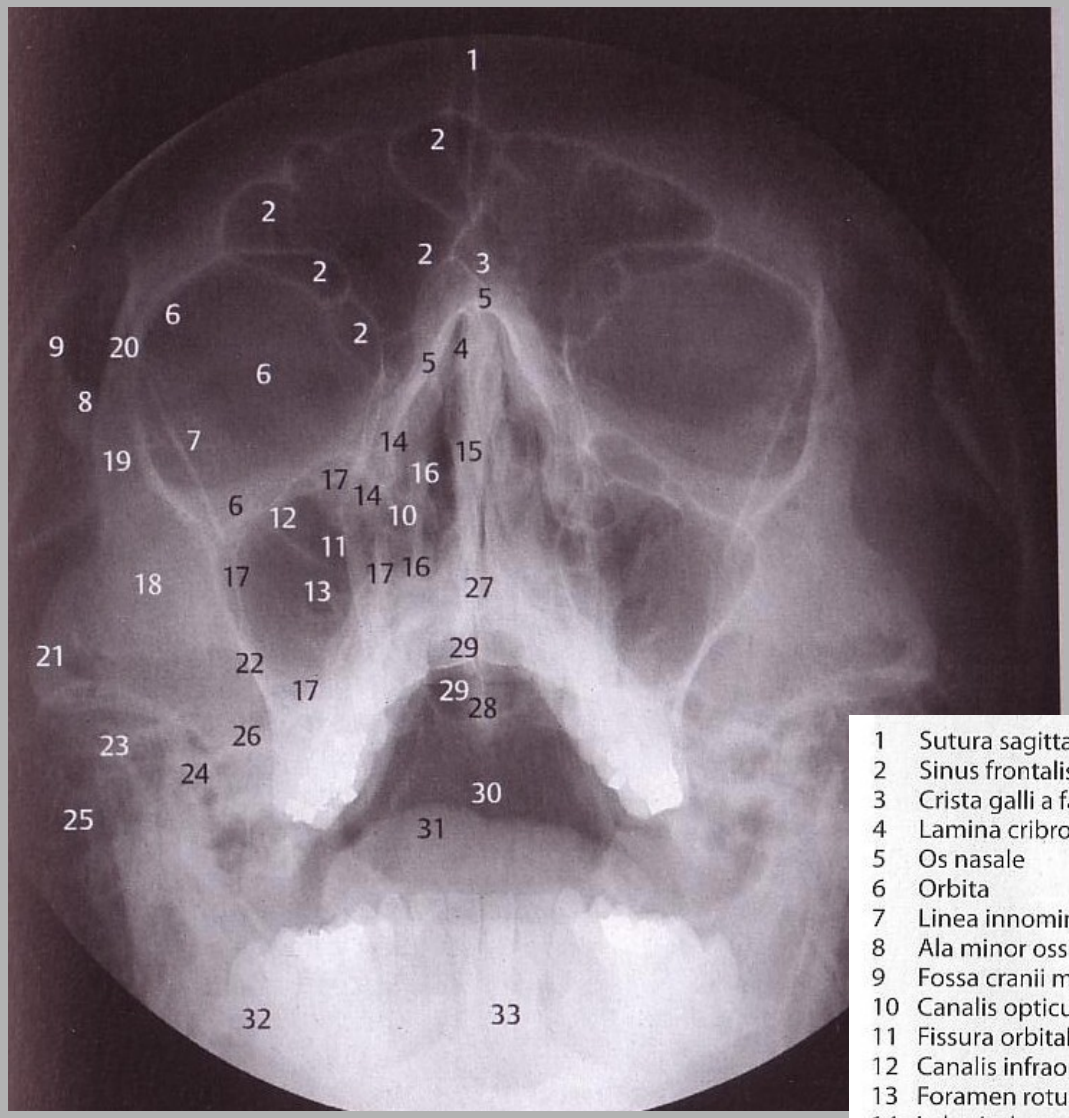
1	Nasion
2	Spina nasalis anterior
3	Spina nasalis posterior
4	Bod A
5	Bod B
6	Pogonion
7	Menton
8	Gonion
9	Basion
10	Articulare
11	Condylion
12	Porion
13	Orbitale

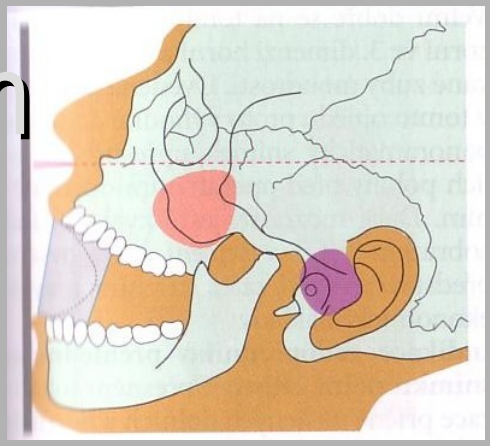
14 sella

Soft Tissue Points

I	Kožní nasion
II	Špička nosu
III	Subnasale
IV	Subspinale
V	Labrale superius
VI	Stomion
VII	Labrale inferius
VIII	Submentale
IX	Kožní pogonion
X	Kožní gnathion

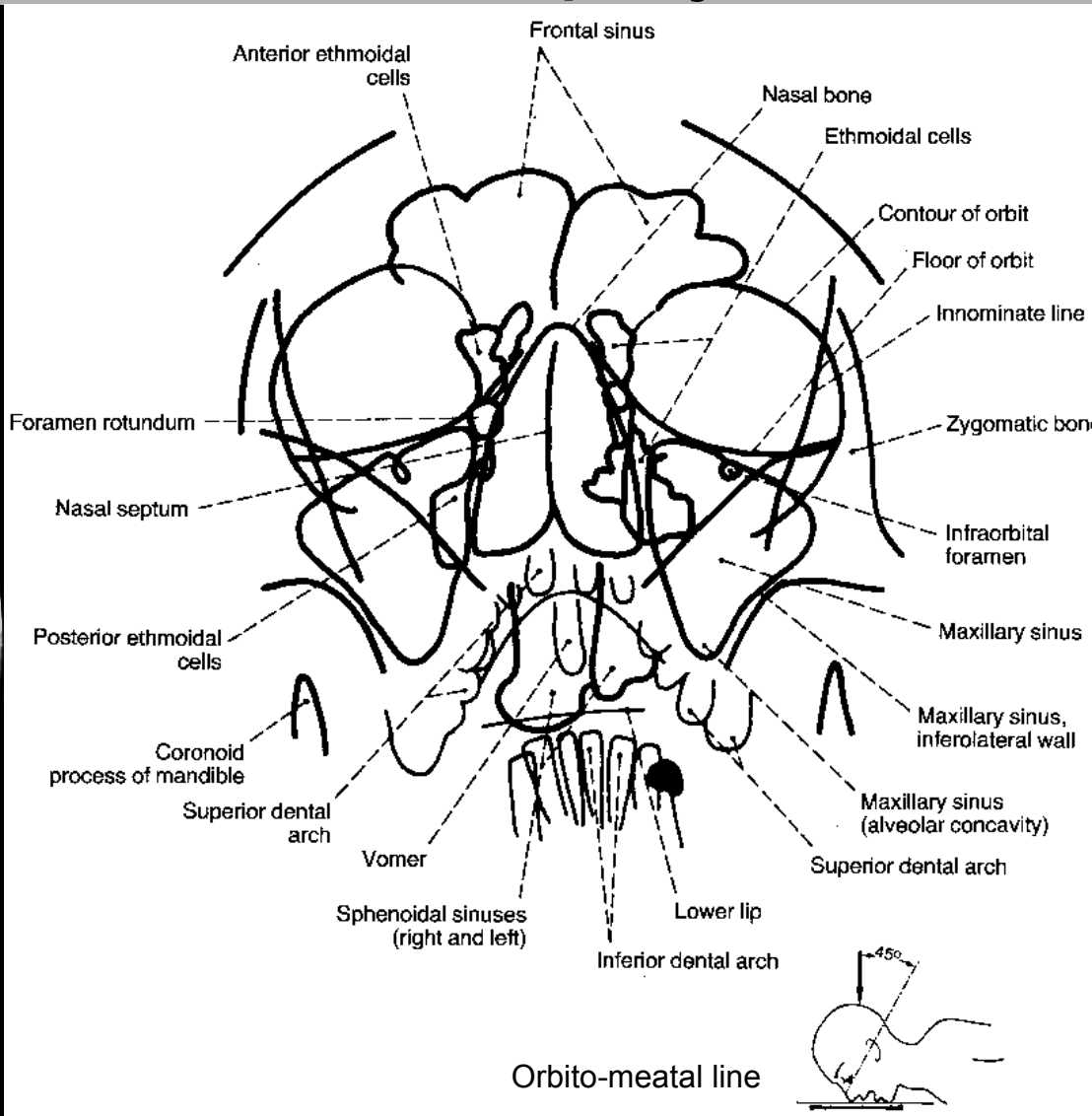
Cranium – semiaxial projection



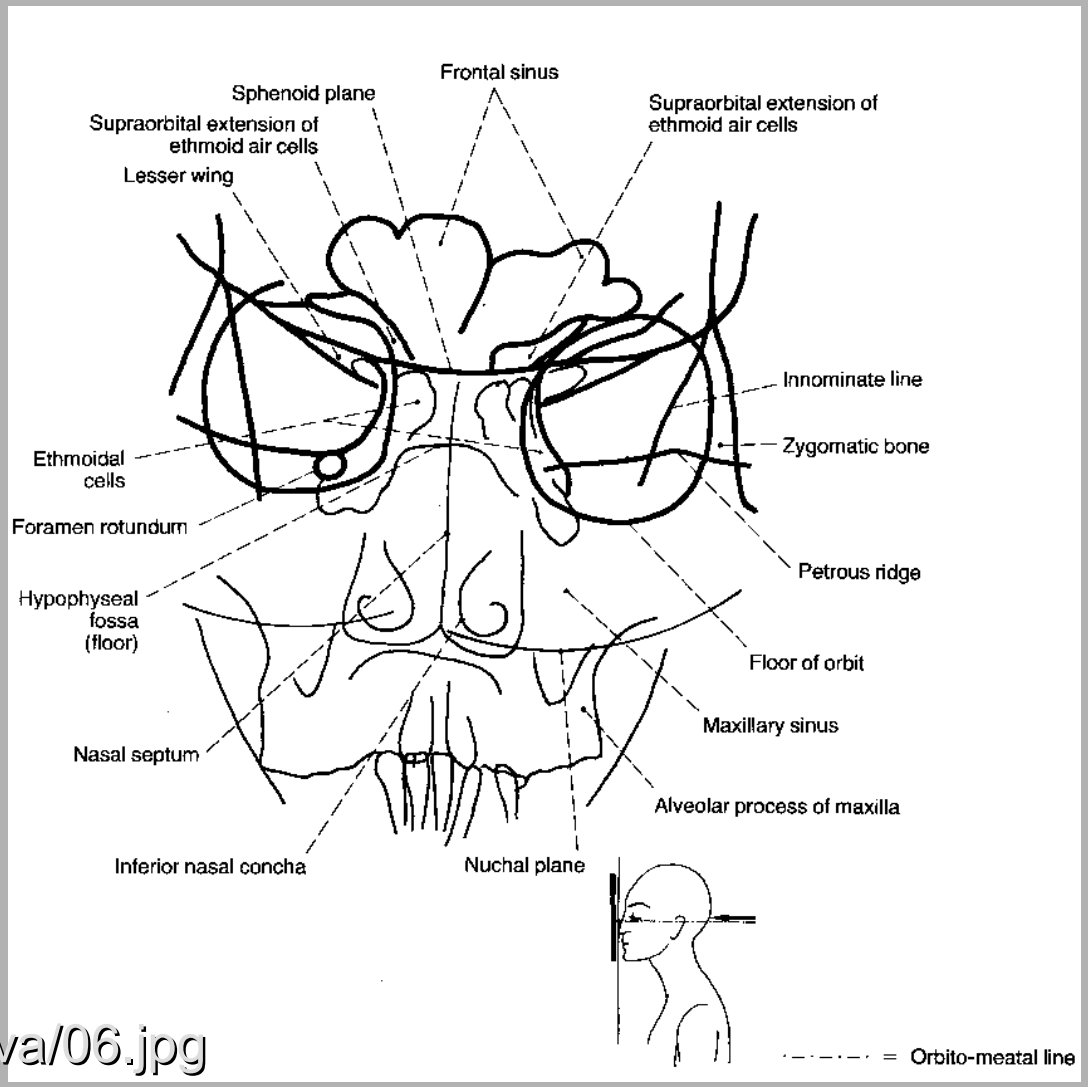


1 Sutura sagittalis
2 Sinus frontalis se septy
3 Crista galli a falx cerebri
4 Lamina cribrosa ossis ethmoidalis
5 Os nasale
6 Orbita
7 Linea innominata (allae majores)
8 Ala minor ossis sphenoidalis
9 Fossa cranii media (ohraničení)
10 Canalis opticus
11 Fissura orbitalis superior
12 Canalis infraorbitalis
13 Foramen rotundum
14 Labyrinthus ethmoidalis
15 Septum nasi osseum
16 Conchae nasales
17 Sinus maxillaris
18 Os zygomaticum
19 Processus frontalis ossis zygomatici
20 Sutura zygomaticofrontalis
21 Arcus zygomaticus
22 Crista zygomaticoalveolaris
23 Processus condylaris mandibulae
24 Processus muscularis (coronoideus) mandibulae
25 Celullae mastoideae
26 Pars petrosa ossis temporalis
27 Spina nasalis anterior
28 Spina nasalis posterior
29 Spina sphenoidalis
30 Pars basilaris ossis occipitalis
31 Dorsum linguae
32 Massa lateralis atlantis
33 Dens axis (epistrophei)

Paranasal sinuses – Water´s projection

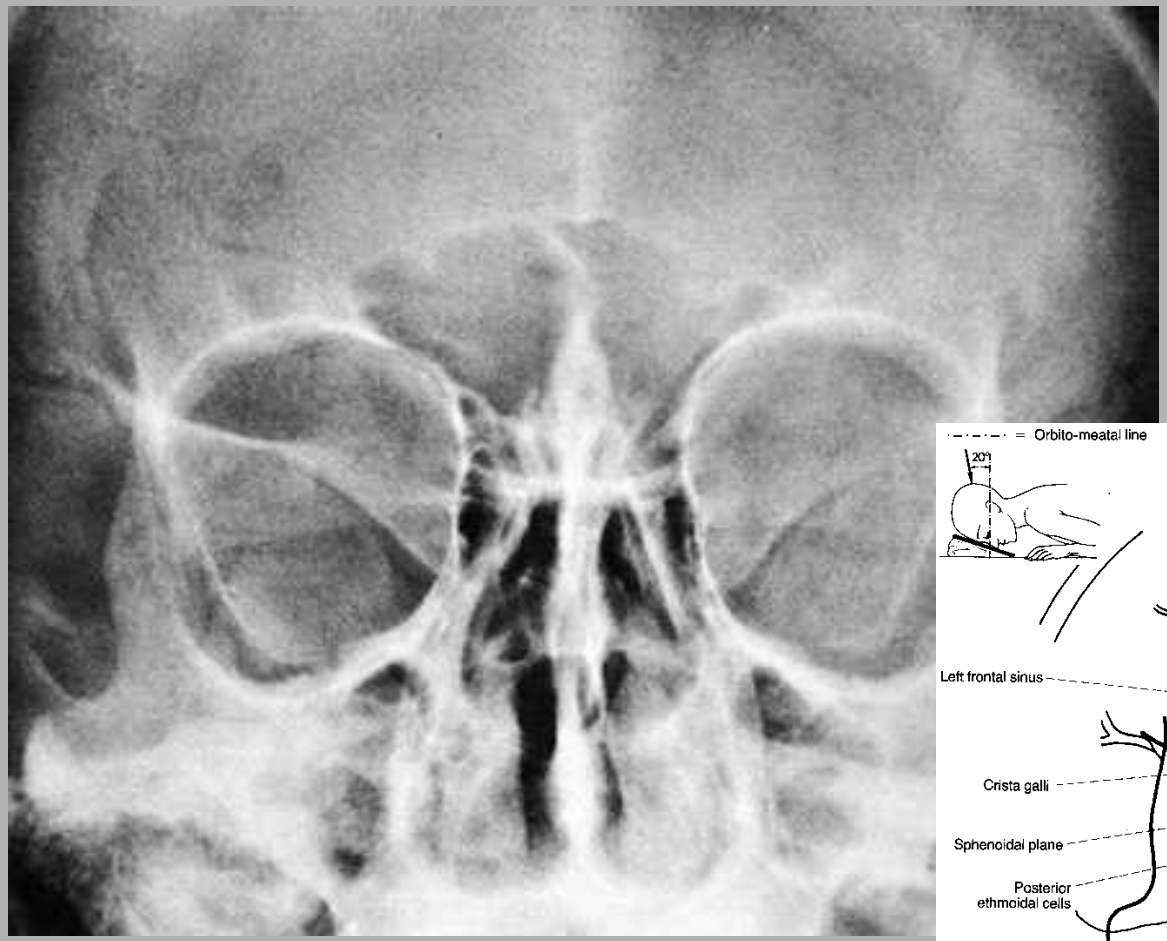


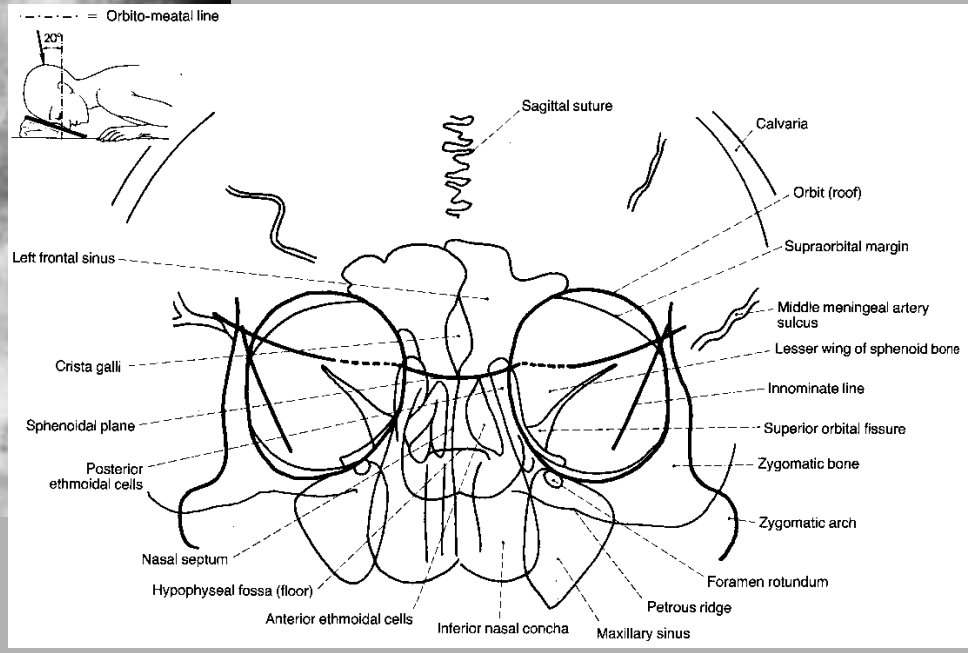
Paranasal sinuses – dorso-ventral projection



- http://rtg.misto.cz/_MAIL_/hlava/06.jpg

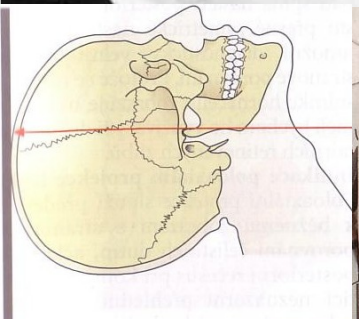
Orbits – dorso-ventral projection

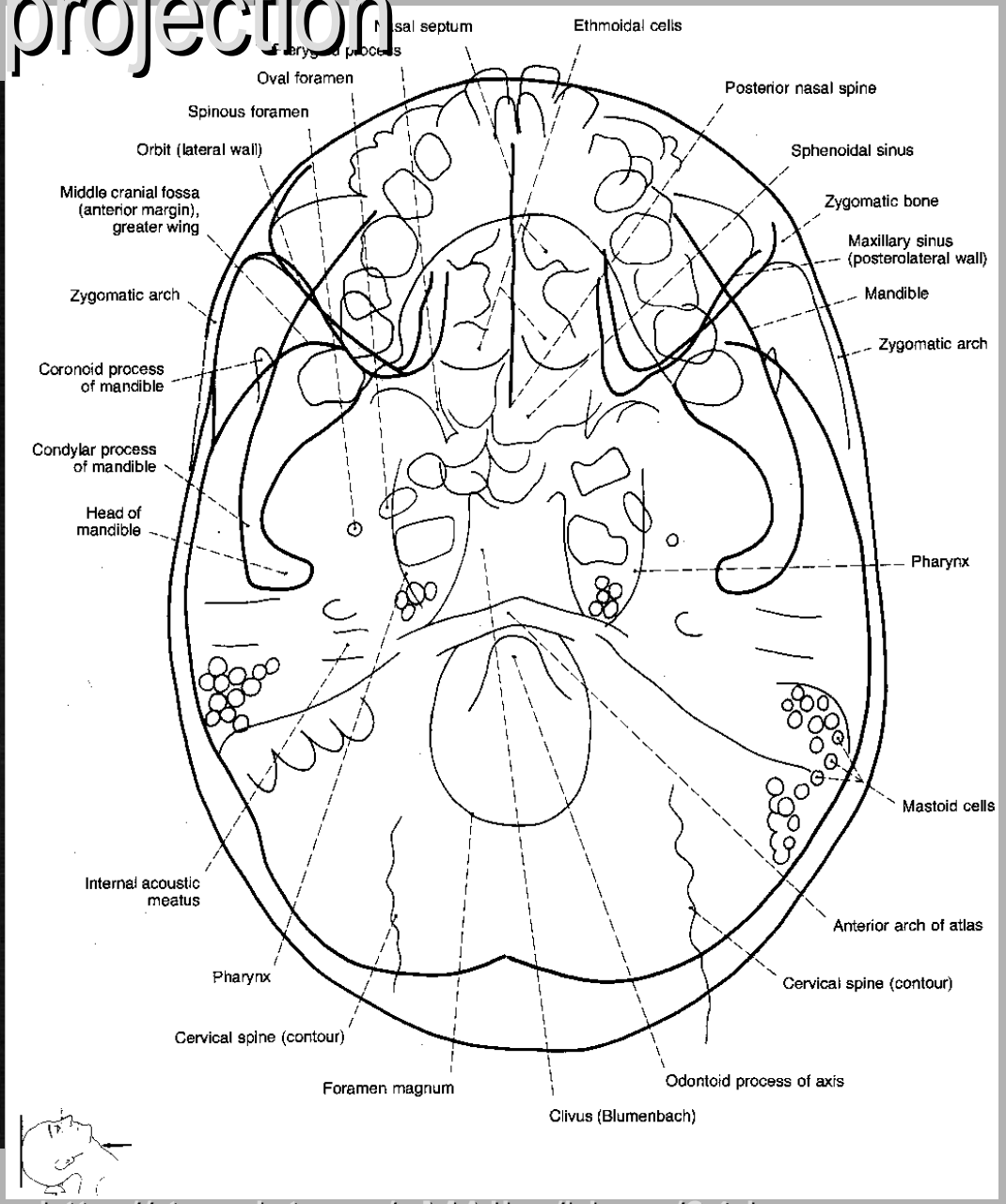




http://rtg.misto.cz/_MAIL_/hlava/09.jpg

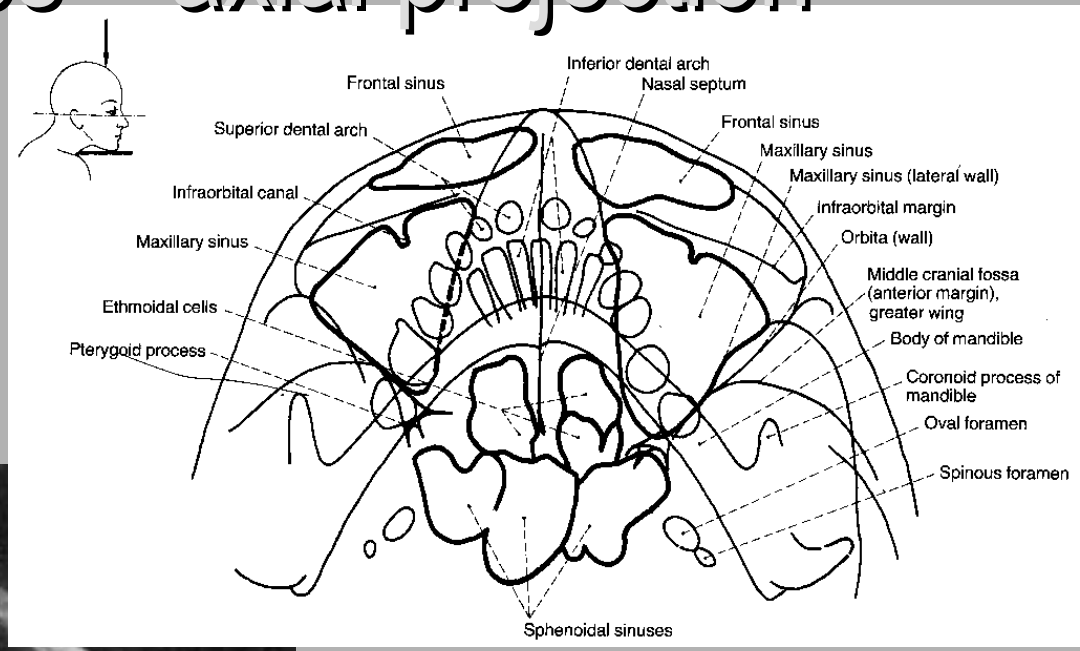
Cranium – axial projection





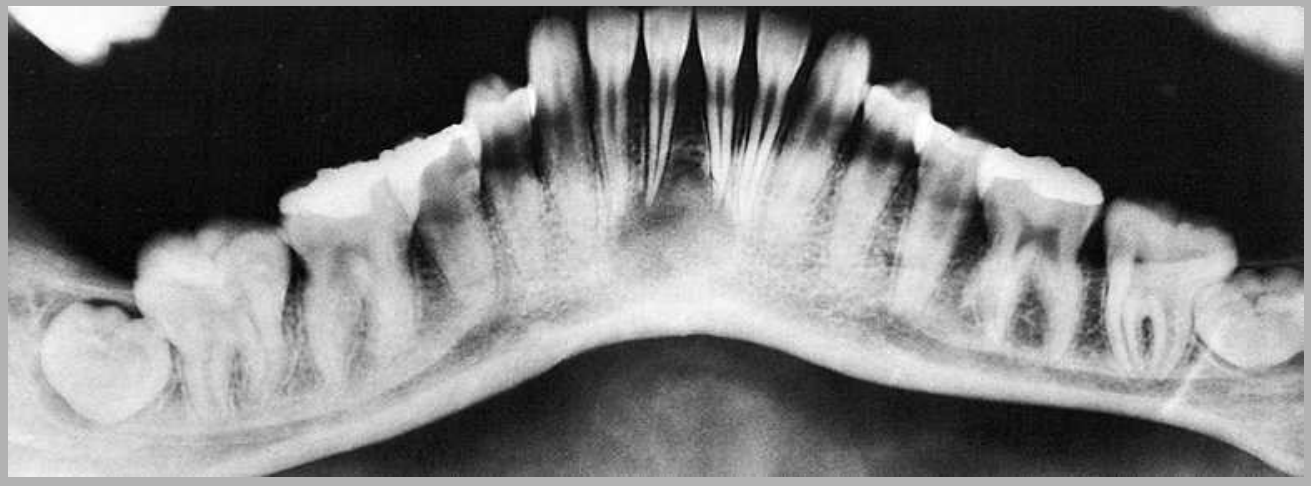
- http://rtg.misto.cz/_MAIL_/hlava/04.jpg

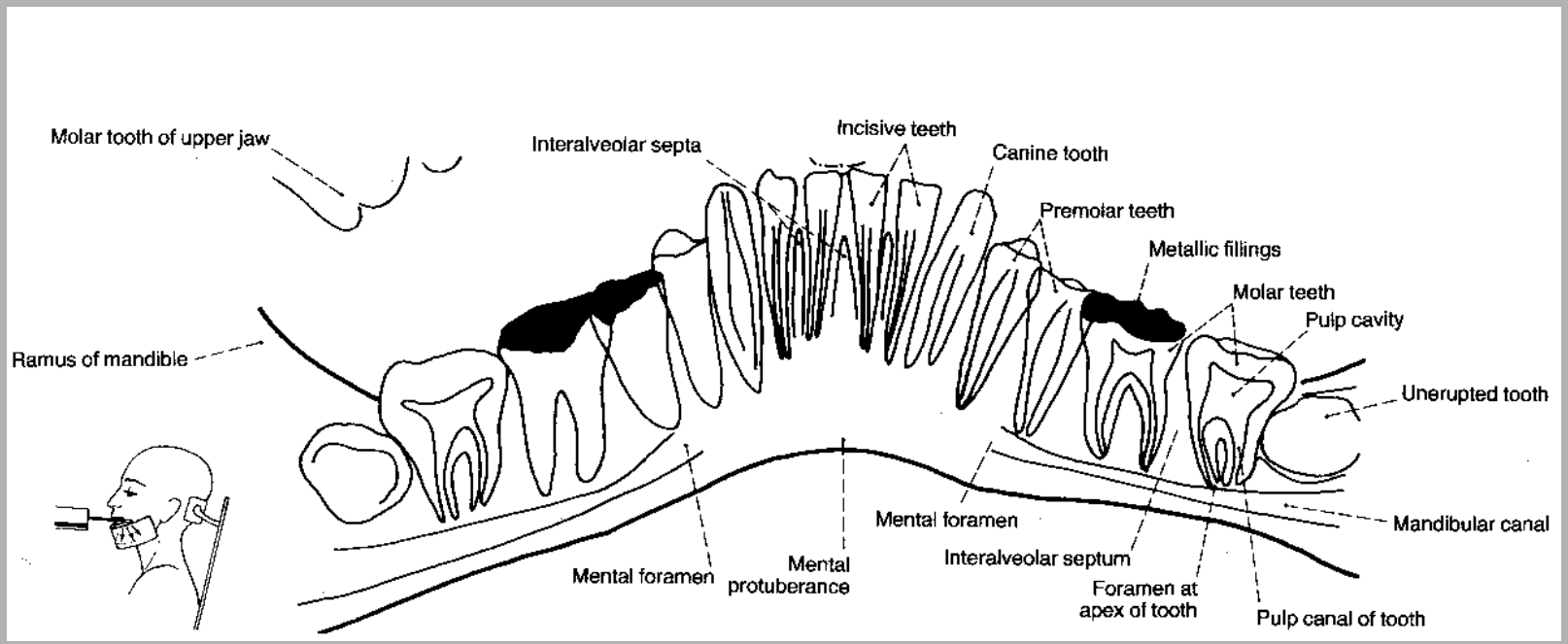
Paranasal sinuses – axial projection



- http://rtg.misto.cz/_MAIL_/hlava/08.jpg

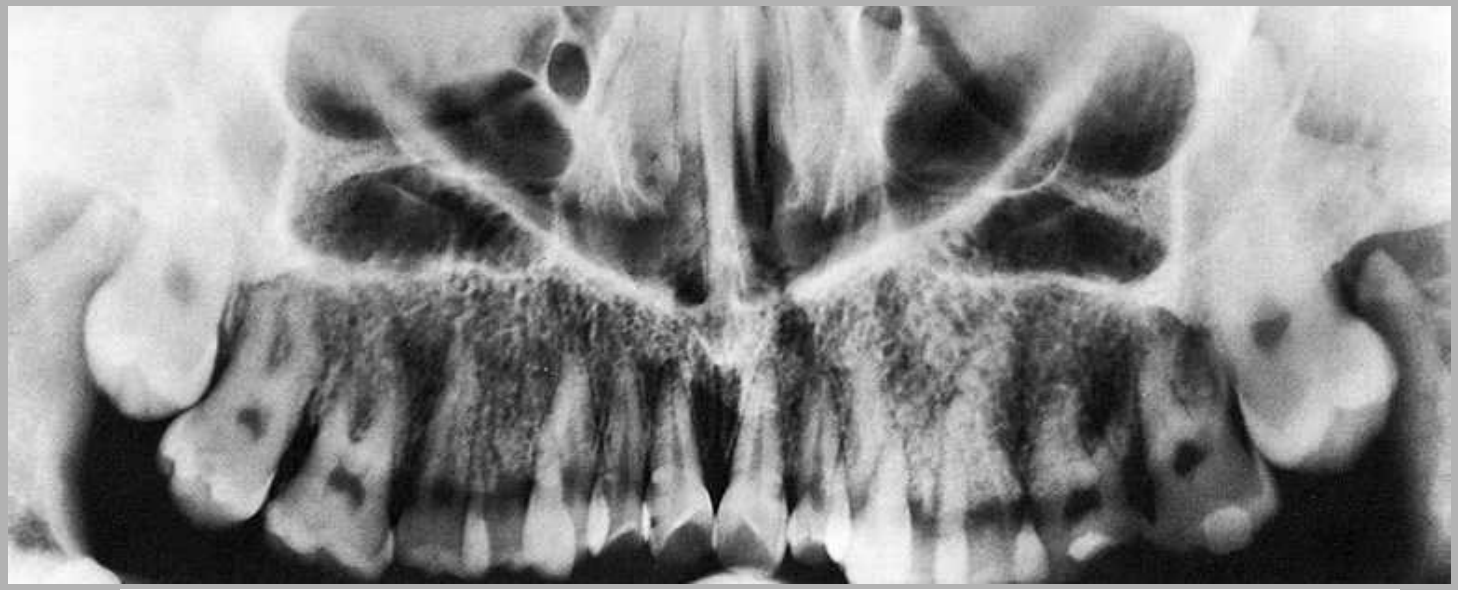
Mandible – panoramic projection

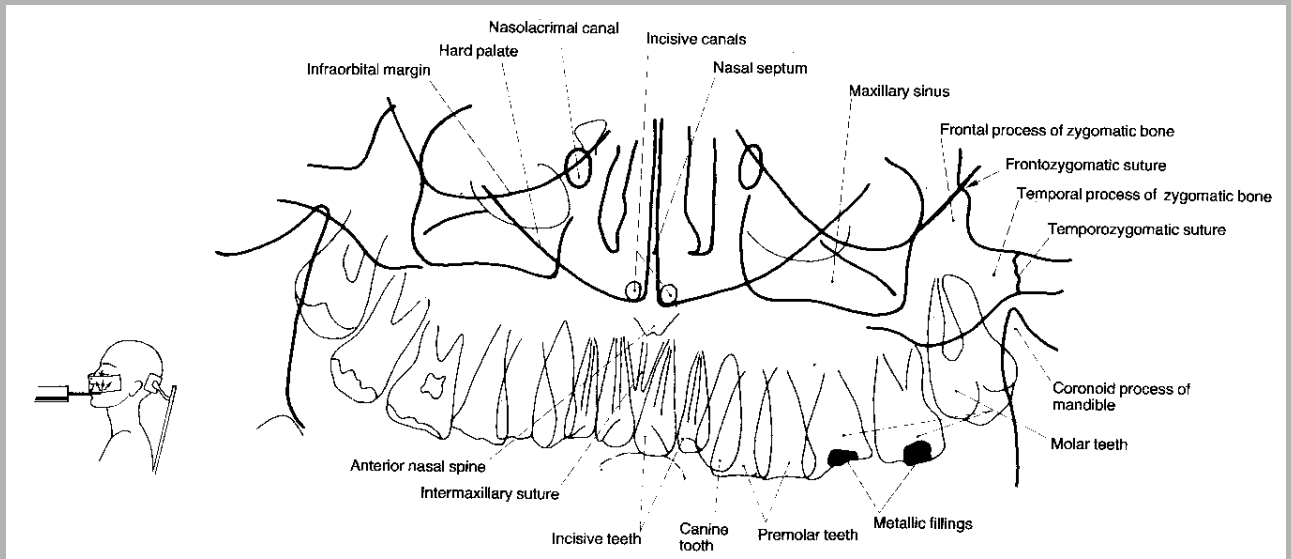




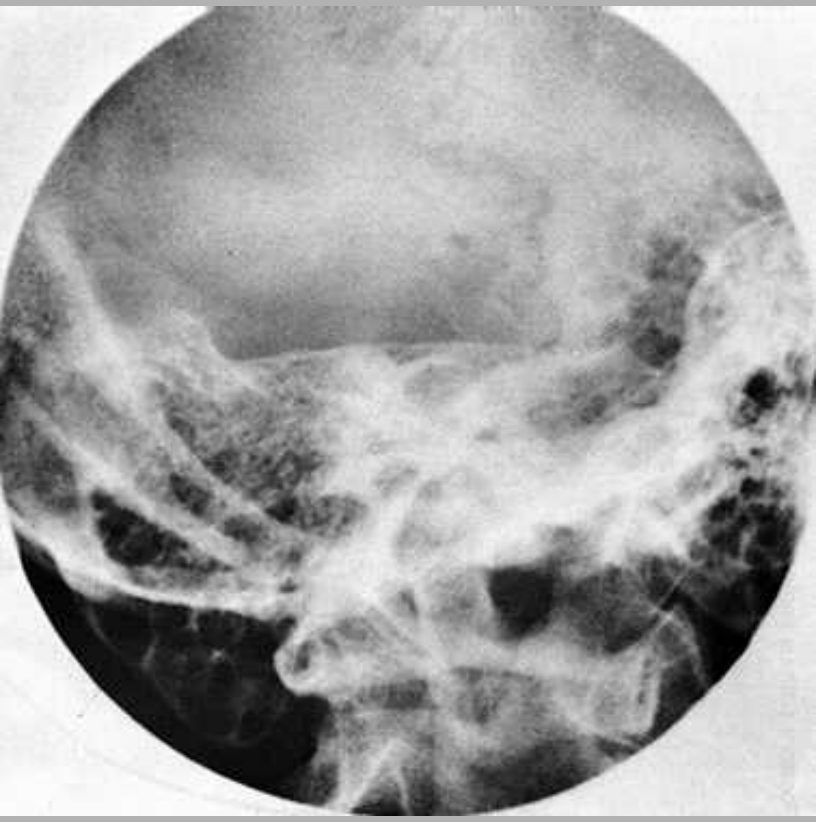
- http://rtg.misto.cz/_MAIL_/hlava/15.jpg

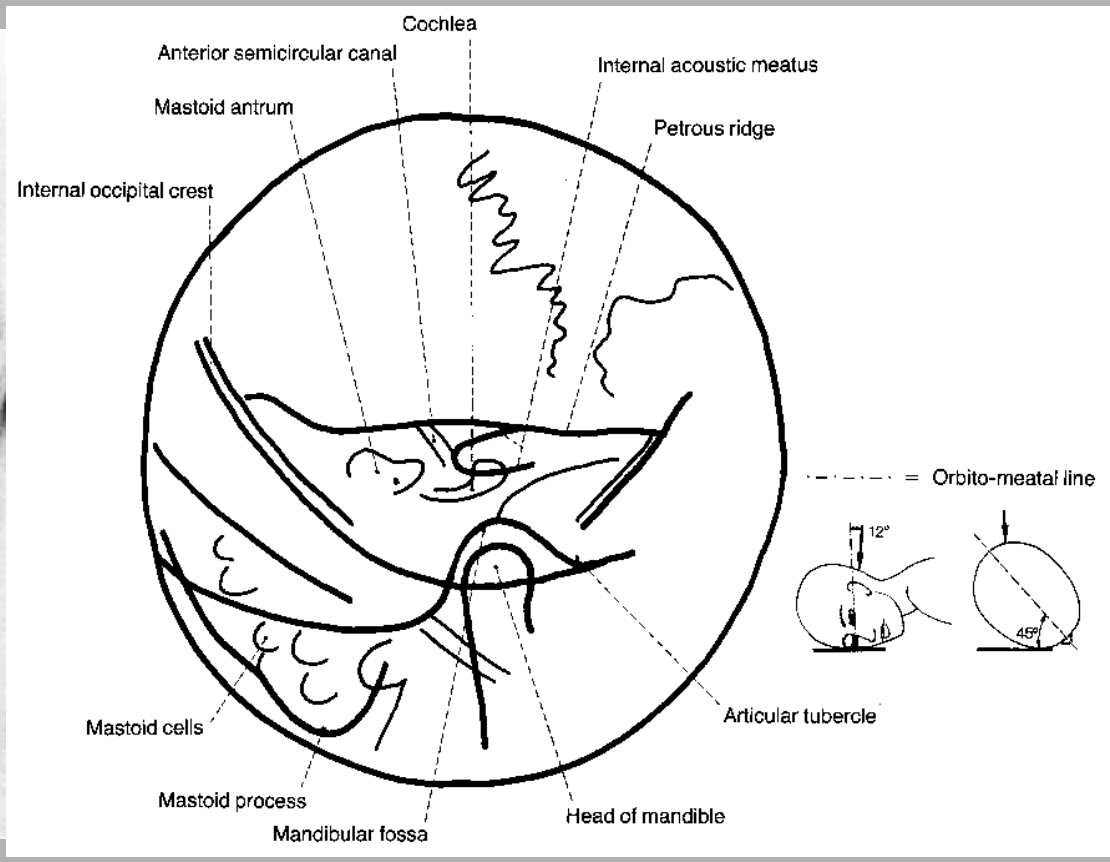
Upper jaw – panoramic projection





Os temporale – Stenver´s – semisagital pr.

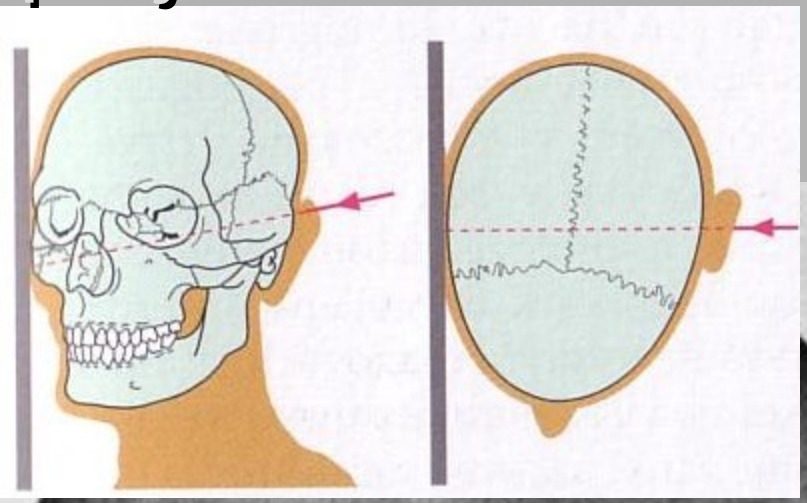


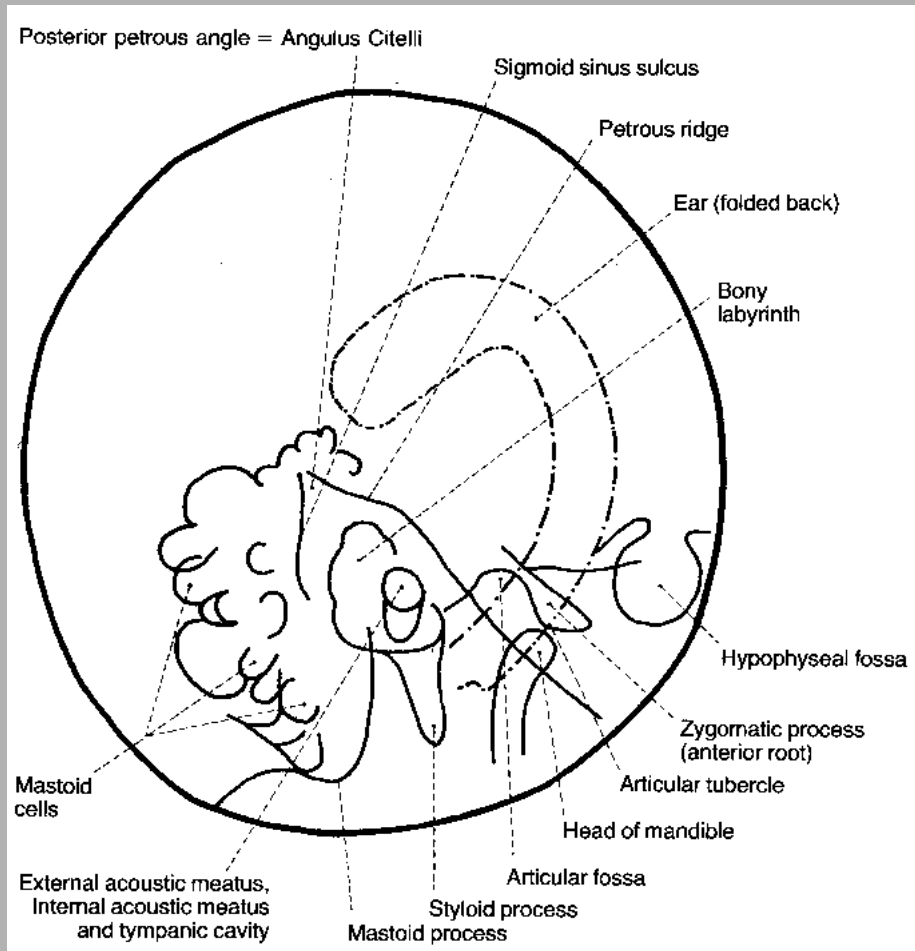


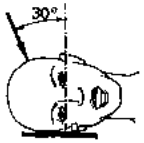
- http://rtg.misto.cz/_MAIL_/hlava/11.jpg

Os temporale – Schüller´s – semilateral projection

- http://rtg.misto.cz/_MAIL_/hlava/12.jpg

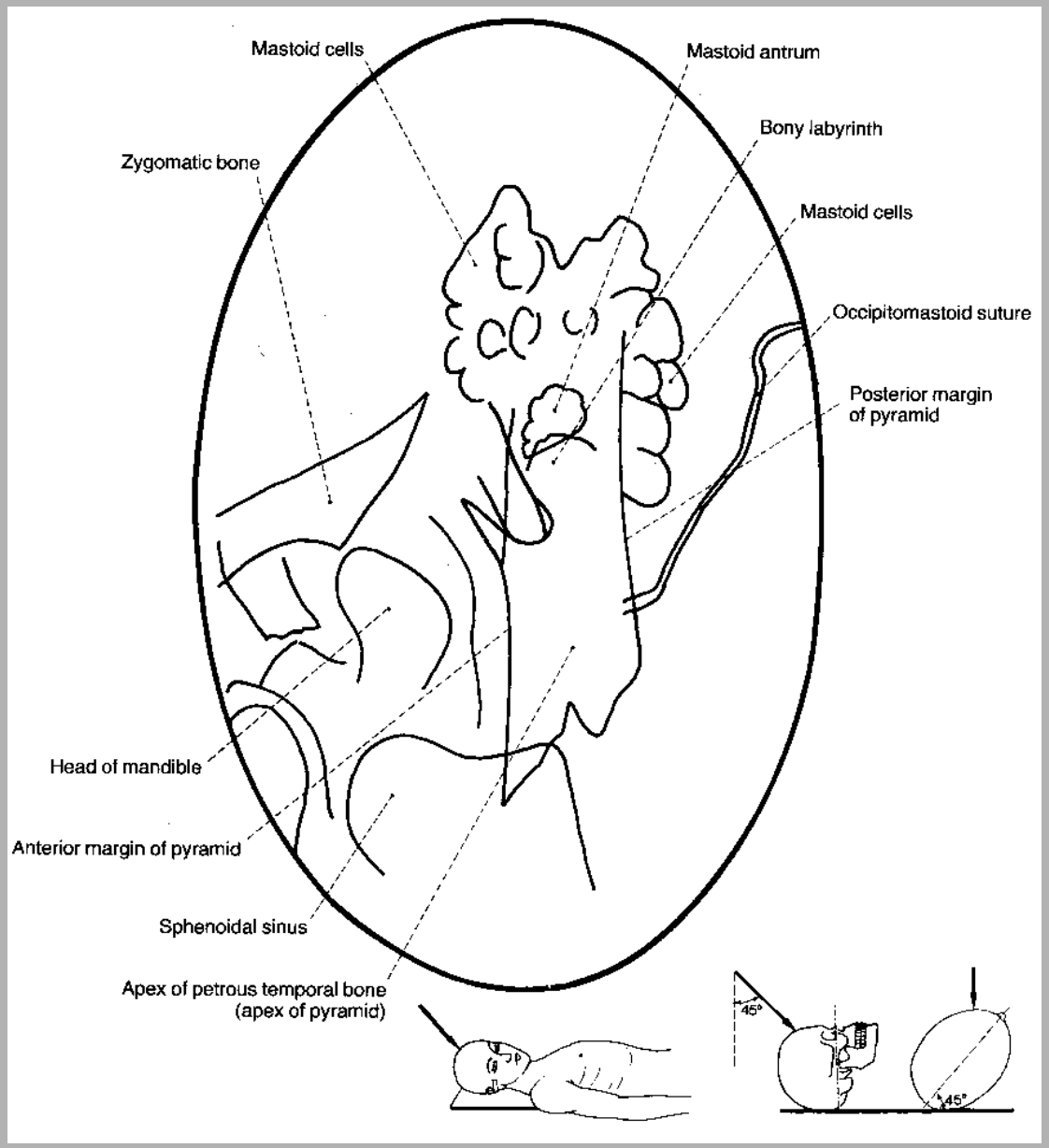






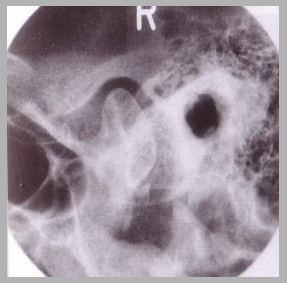
= Orbito-meatal line

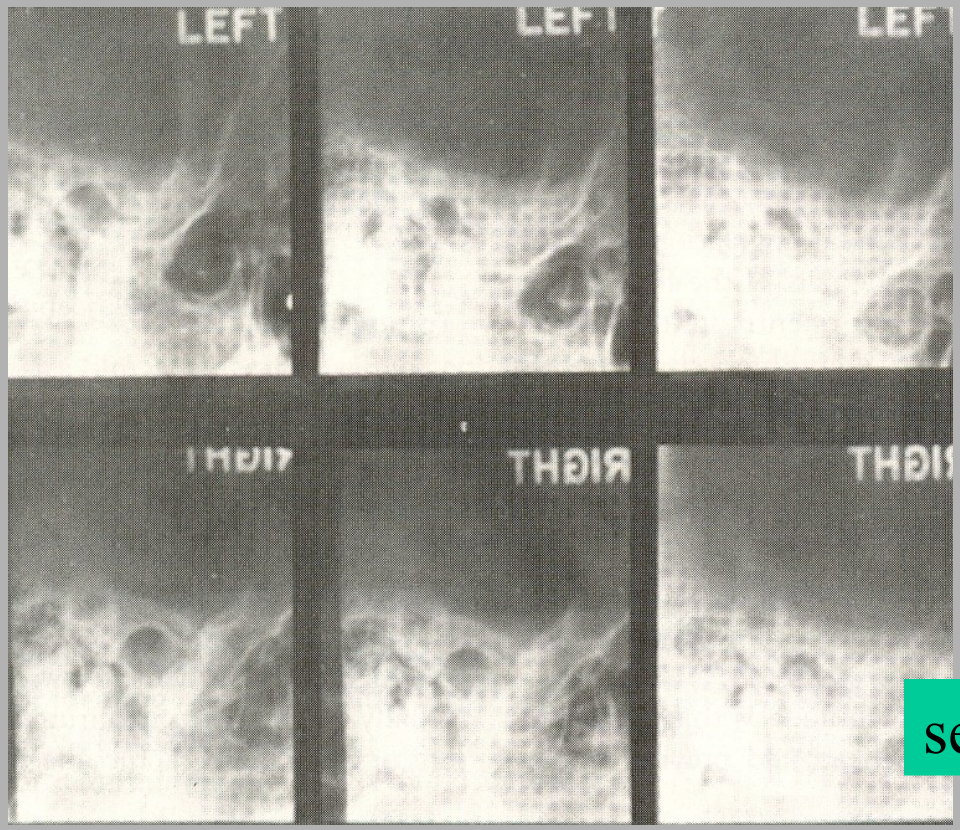
Os temporale – Mayer – semiaxial pr.

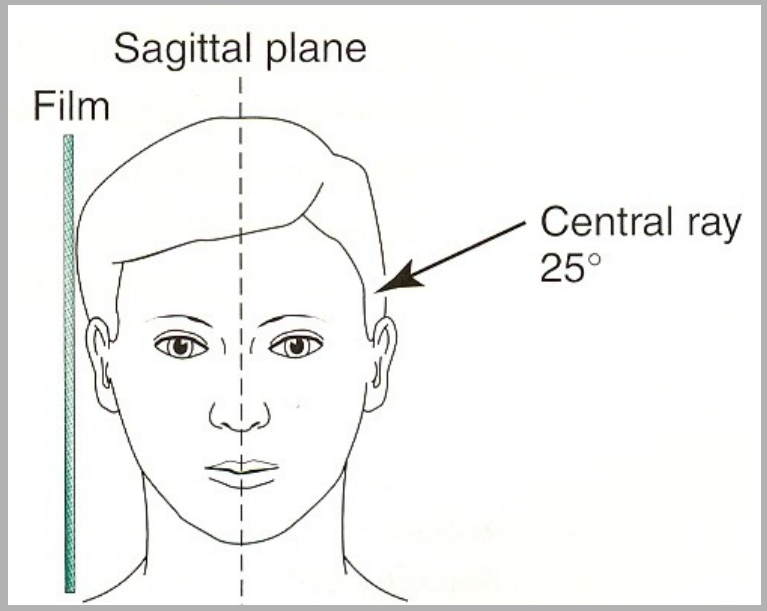


- http://rtg.misto.cz/_MAIL_/hlava/13.jpg

Temporomandibular joint - TMJ







serial radiogram TMJ

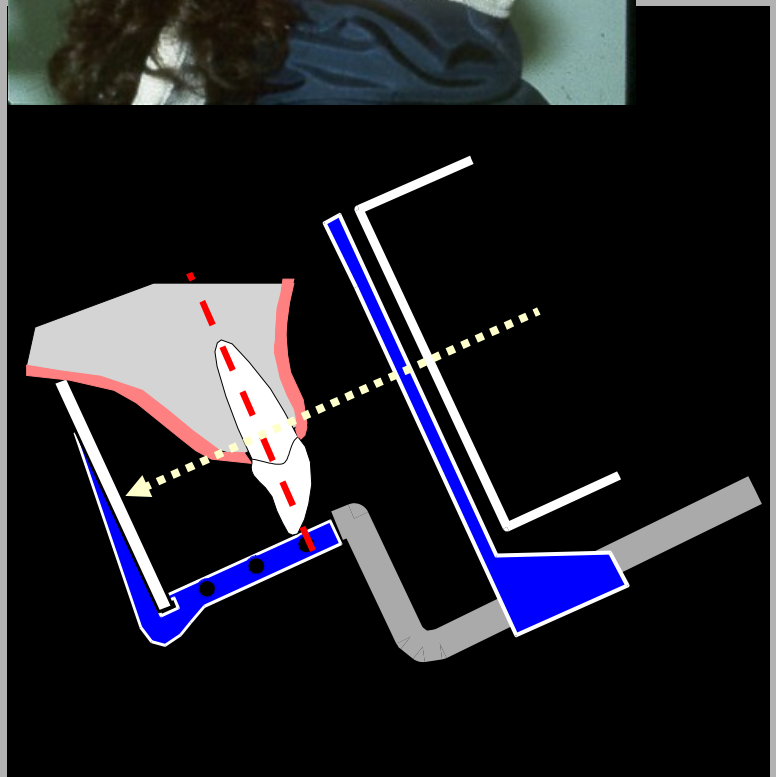
- X-ray beam pass vertical +25 degree to center of film.
- Entering 6-7cm over meatus acusticus.

- condyl head
- fossa glenoidalis
- closed mouth
- opened mouth

Intraoral exposures

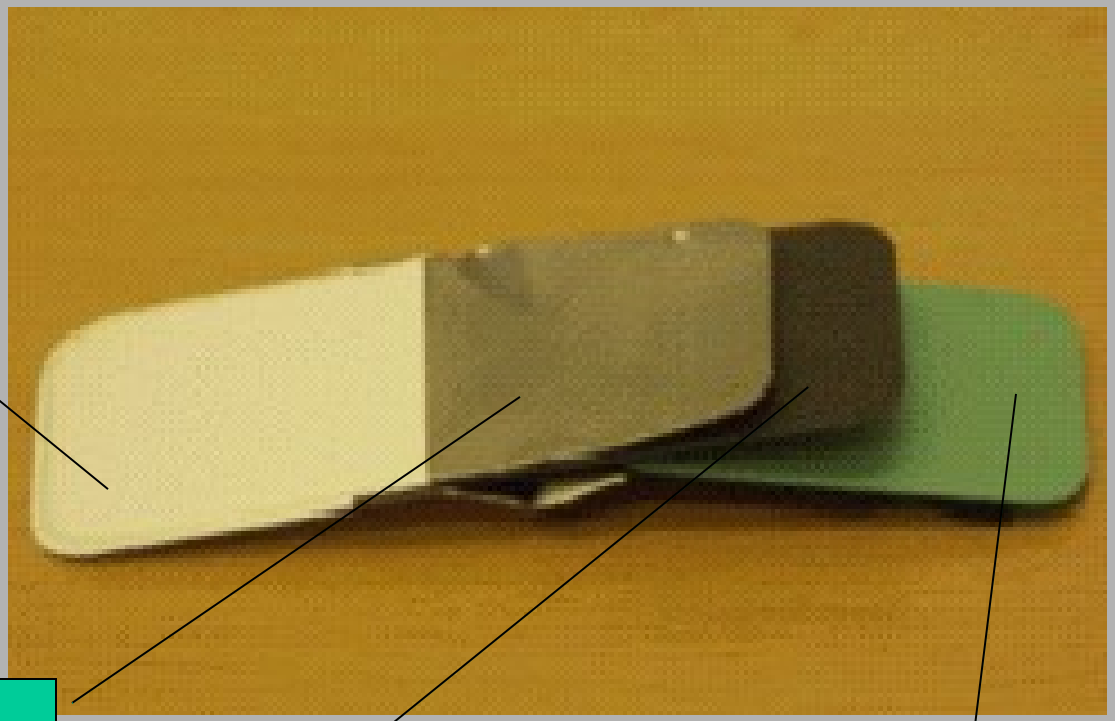
Intraoral X-ray device

- Voltage of X-ray tube
  - 50-90 kV
- Filtration of primary beam
  - 1,5 mm Al - U<70 kV
  - 2,5 mm Al - U > 70 kV
- Body tube
  - length of body tube = 10-30 cm



Films for intraoral exposure

- dental films



plastic covering

lead filter on the back

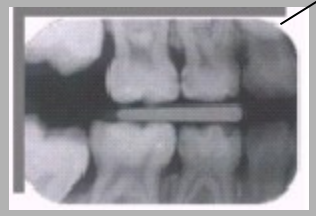
paper covering on
both sides of the film

film

Films for intraoral exposures

- standard formats

clasic 31x41 mm



child 22x35 mm

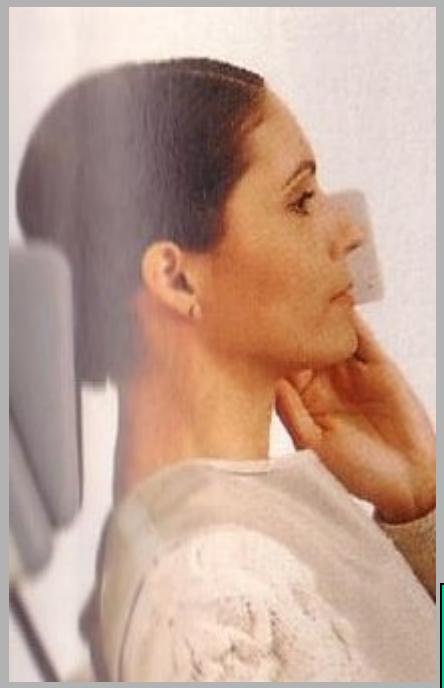
special 27x54 mm

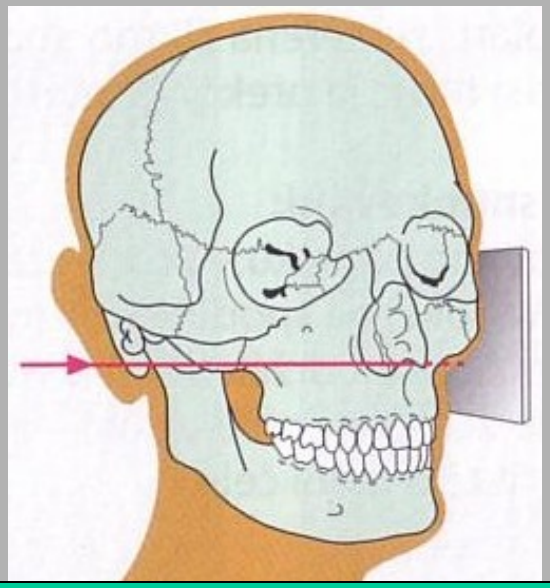
special 57x76mm

- The film covering is larger than film (over 1 mm)

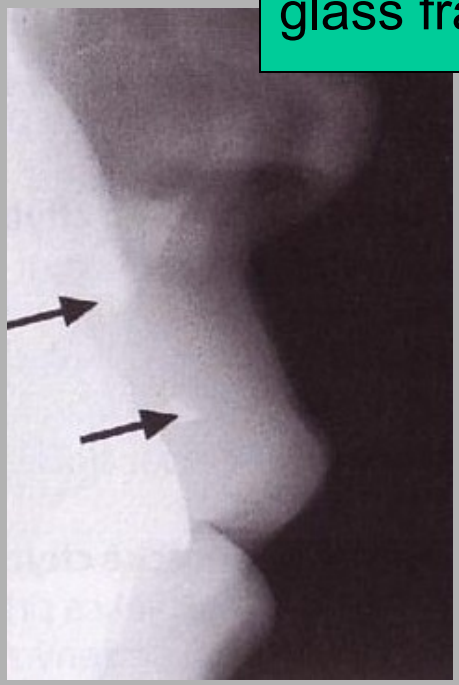
Extraoral exposures

Extraoral lateral exposure of frontal upper frontal part





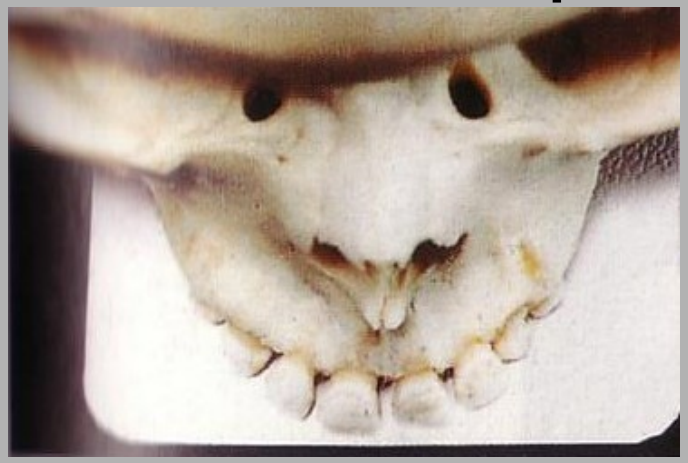
spina nasalis anterior
perpendicular to the film

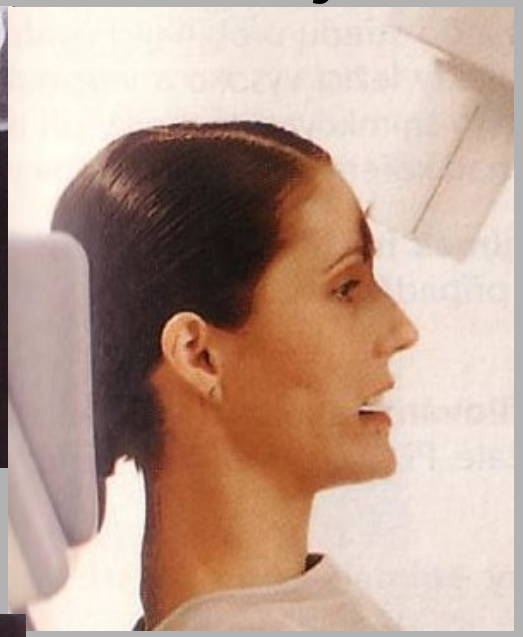


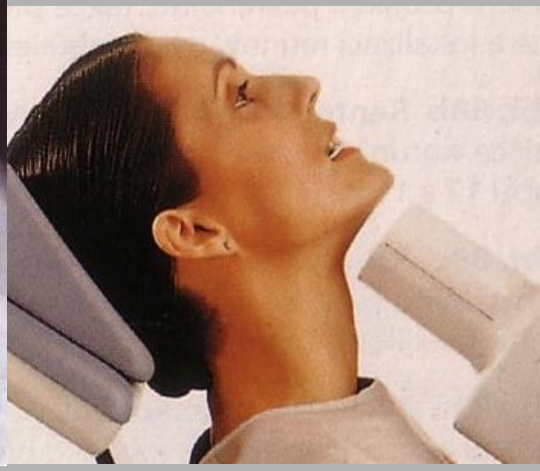
glass fragments

- depicture of nasal bones
- alien particles

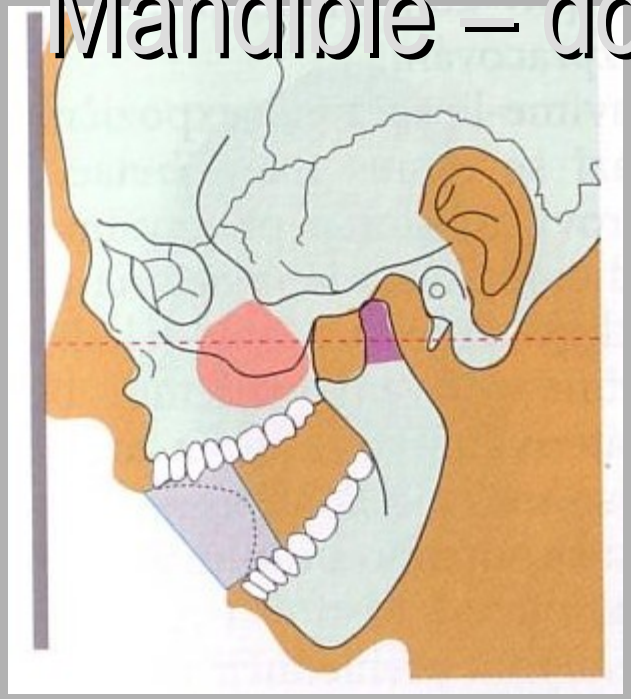
Occlusal exposure of upper and low jaw

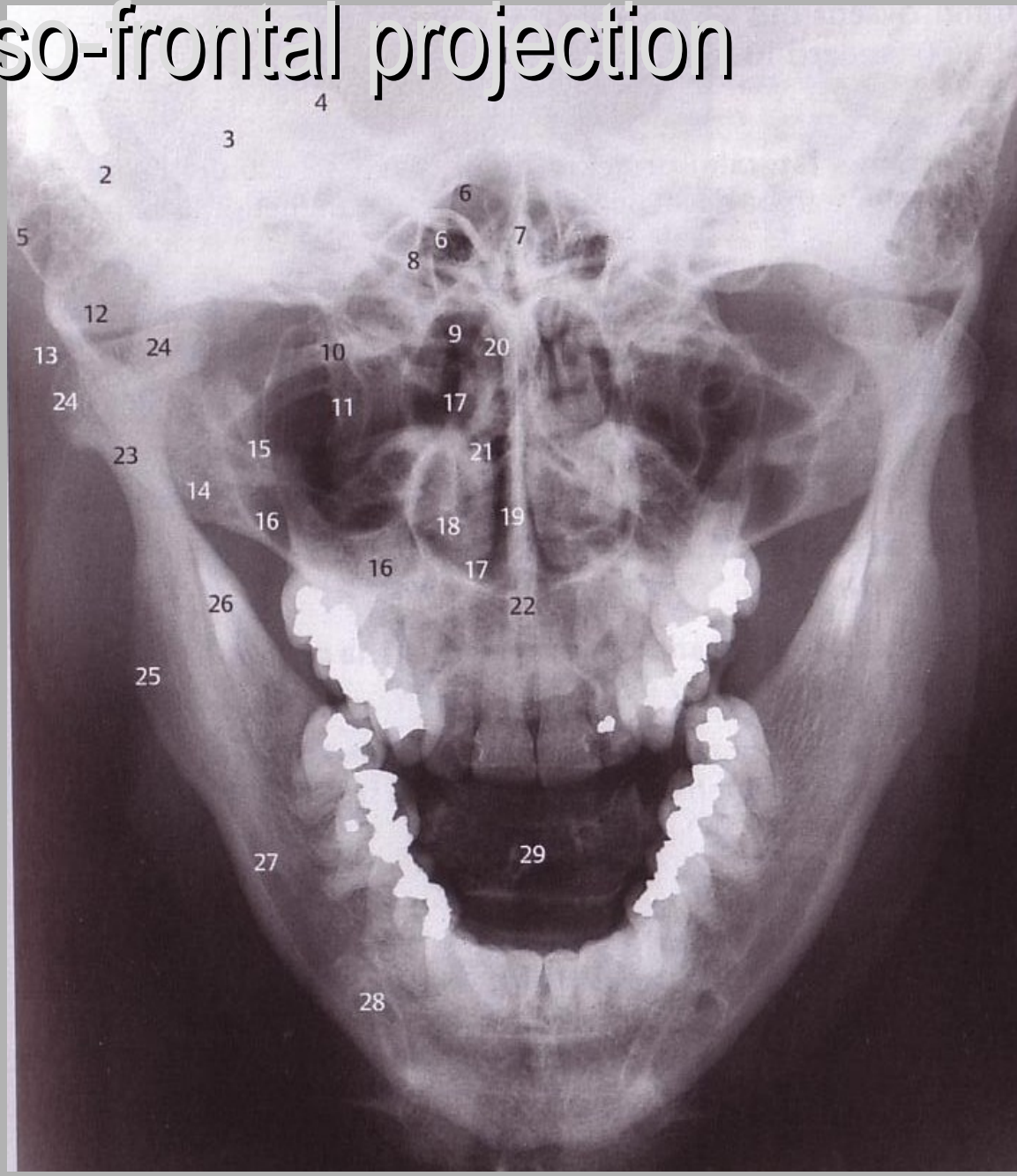




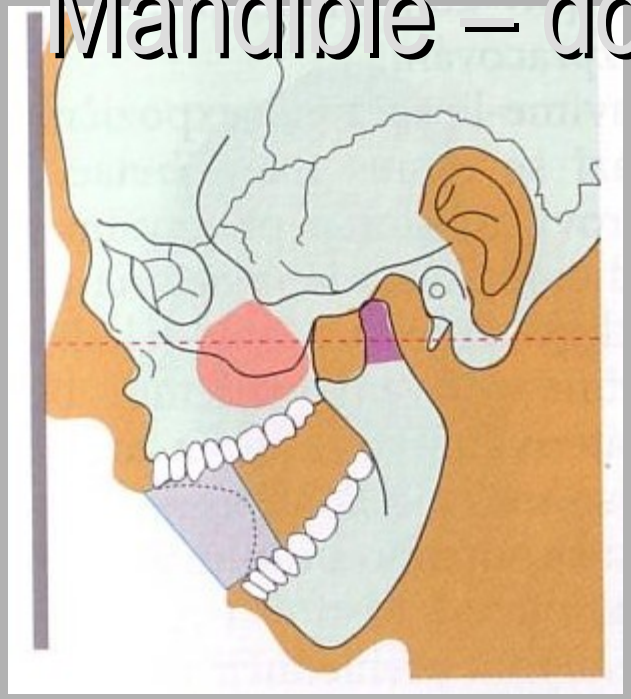


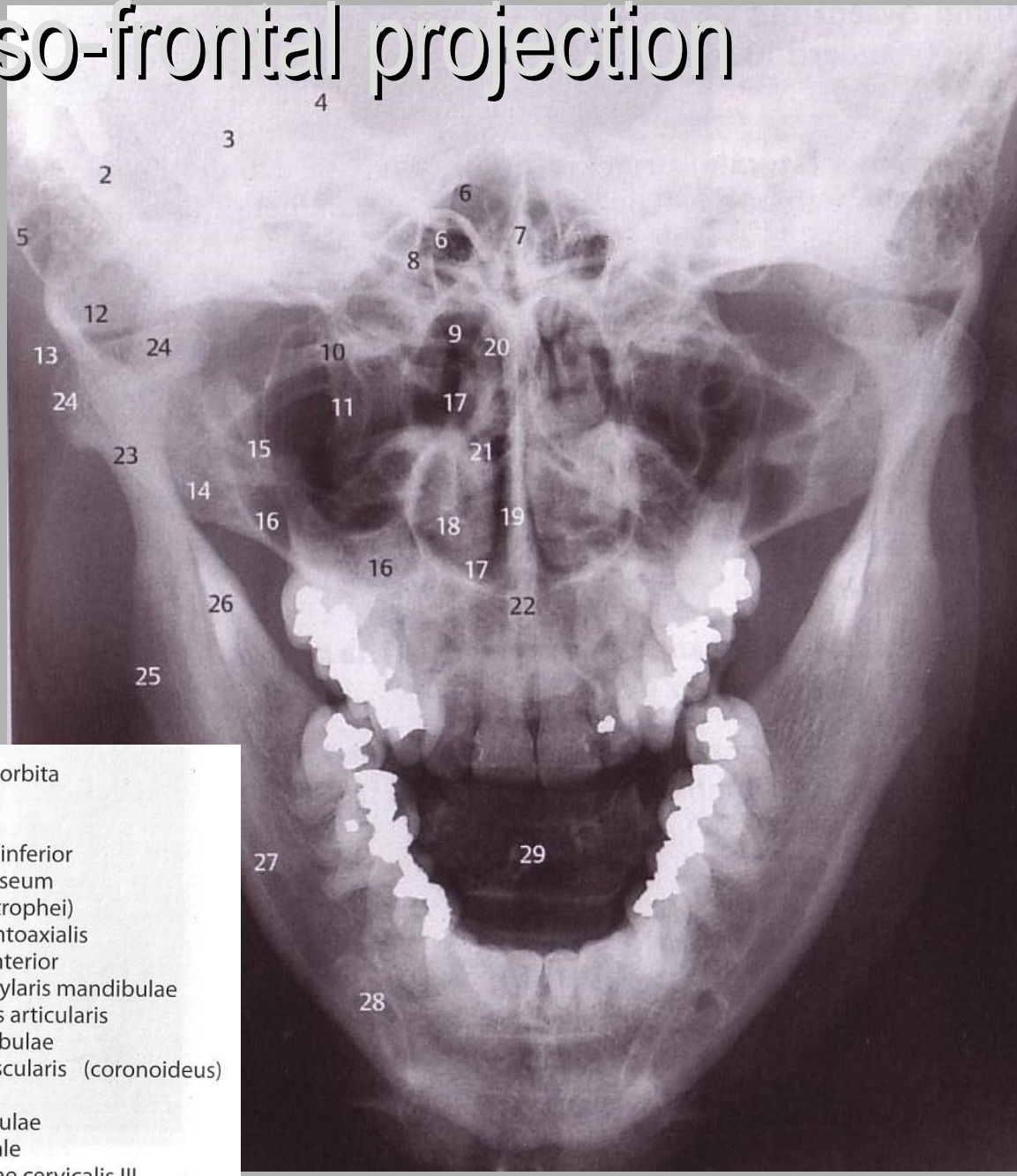
Mandible – dorso-frontal projection





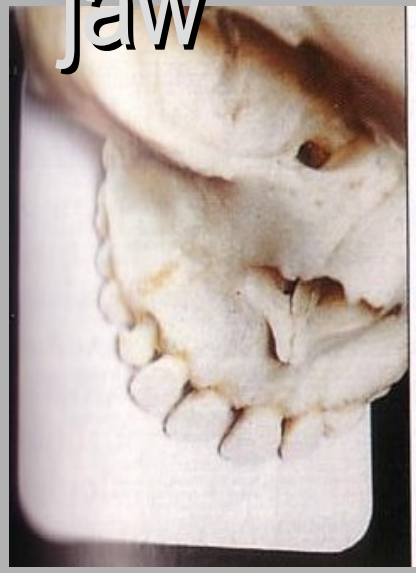
Mandible – dorso-frontal projection

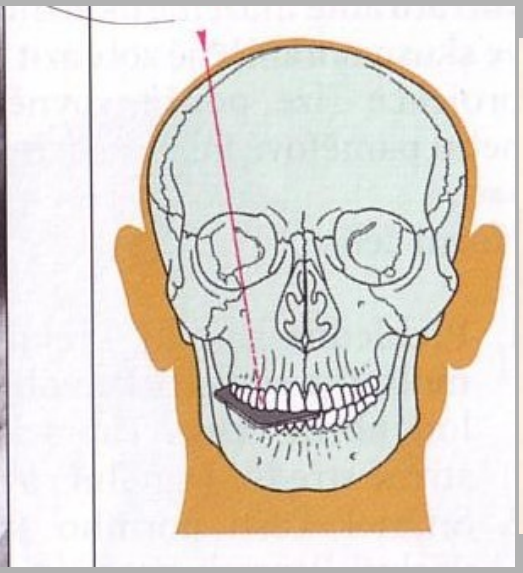


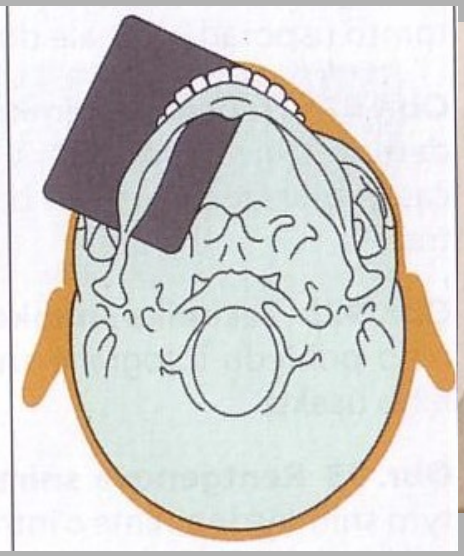


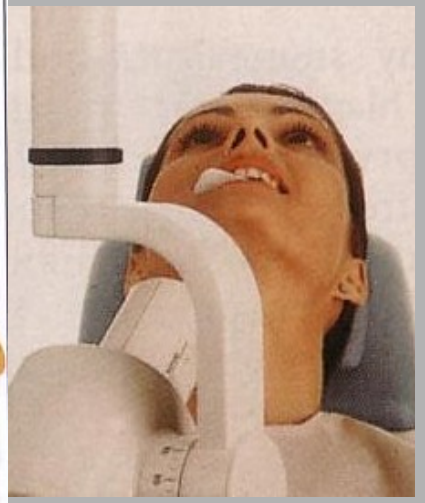
1 Crista frontalis
2 Squama ossis temporalis
3 Pars petrosa ossis temporalis
4 Eminentia arcuata
5 Processus mastoideus ossis temporalis
6 Sinus sphenoidalis v superpozici s částí sinus frontalis
7 Crista galli
8 Planum sphenoideum
9 Articulatio atlantooccipitalis
10 Processus transversum atlantis
11 Processus pterygoideus ossis sphenoidalis
12 Eminentia articularis
13 Arcus zygomaticus
14 Os zygomaticum
15 Margo inferior, orbita
16 Sinus maxillaris
17 Cavum nasi
18 Concha nasalis inferior
19 Septum nasi osseum
20 Dens axis (epistrophei)
21 Articulatio atlantoaxialis
22 Spina nasalis anterior
23 Processus condylaris mandibulae
24 Kondylus, facies articularis
25 Angulus mandibulae
26 Processus muscularis (coronoideus) mandibulae
27 Canalis mandibulae
28 Foramen mentale
29 Corpus vertebrae cervicalis III

Semiprofile exposures of upper and low jaw

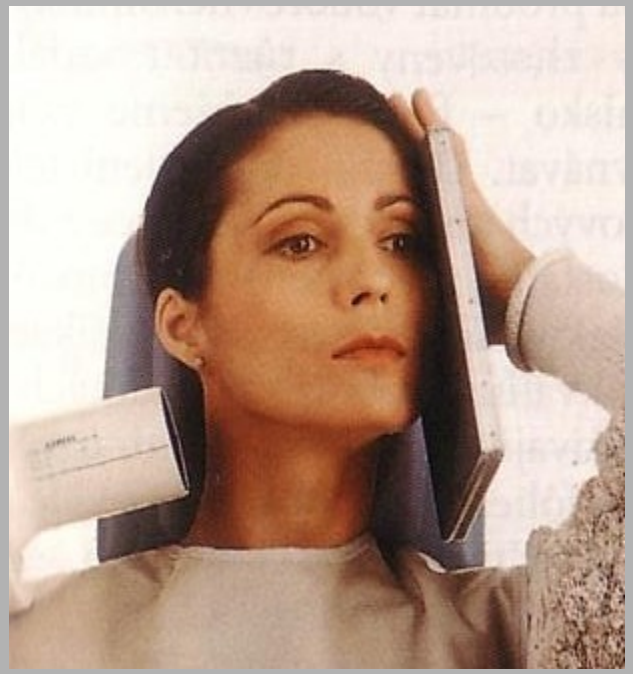


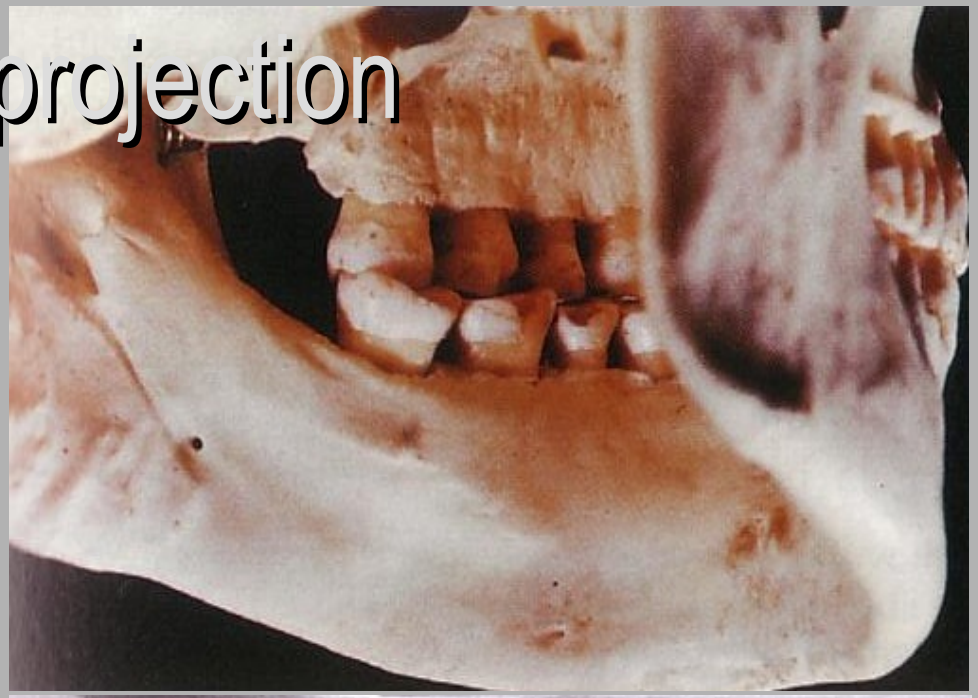


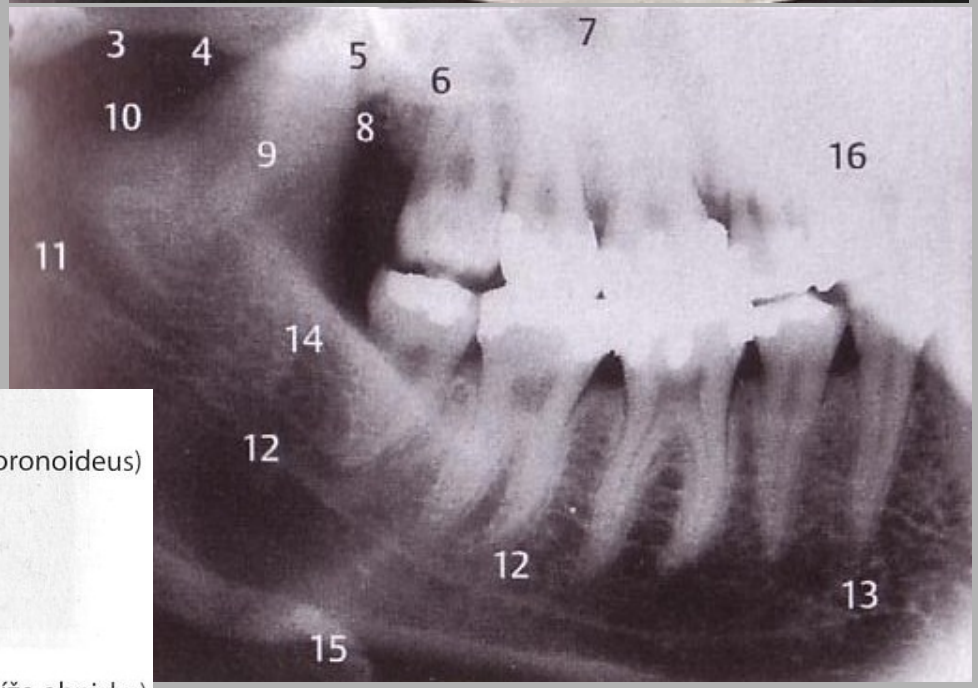




Mandible – lateral projection

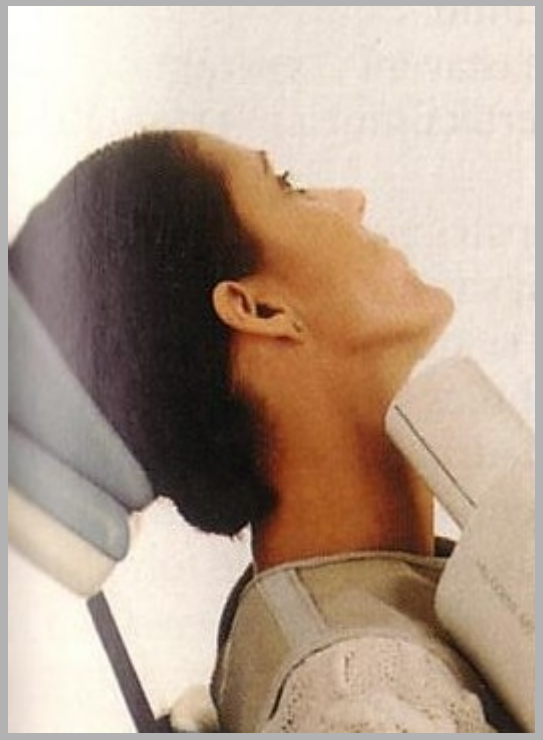






1 Kondylus
2 Eminentia articularis
3 Arcus zygomaticus
4 Sutura zygomaticoalveolaris
5 Processus pterygoideus ossis sphenoidalis
6 Os zygomaticum
7 Sinus maxillaris
8 Tuber maxillae
9 Processus muscularis (coronoideus)
10 Incisura semilunaris
11 Lingula
12 Canalis mandibulae
13 Foramen mentale
14 Crista temporalis
15 Os hyoideum
16 Angulus mandibulae (blíže ohnisku)

Caudal wisdom tooth



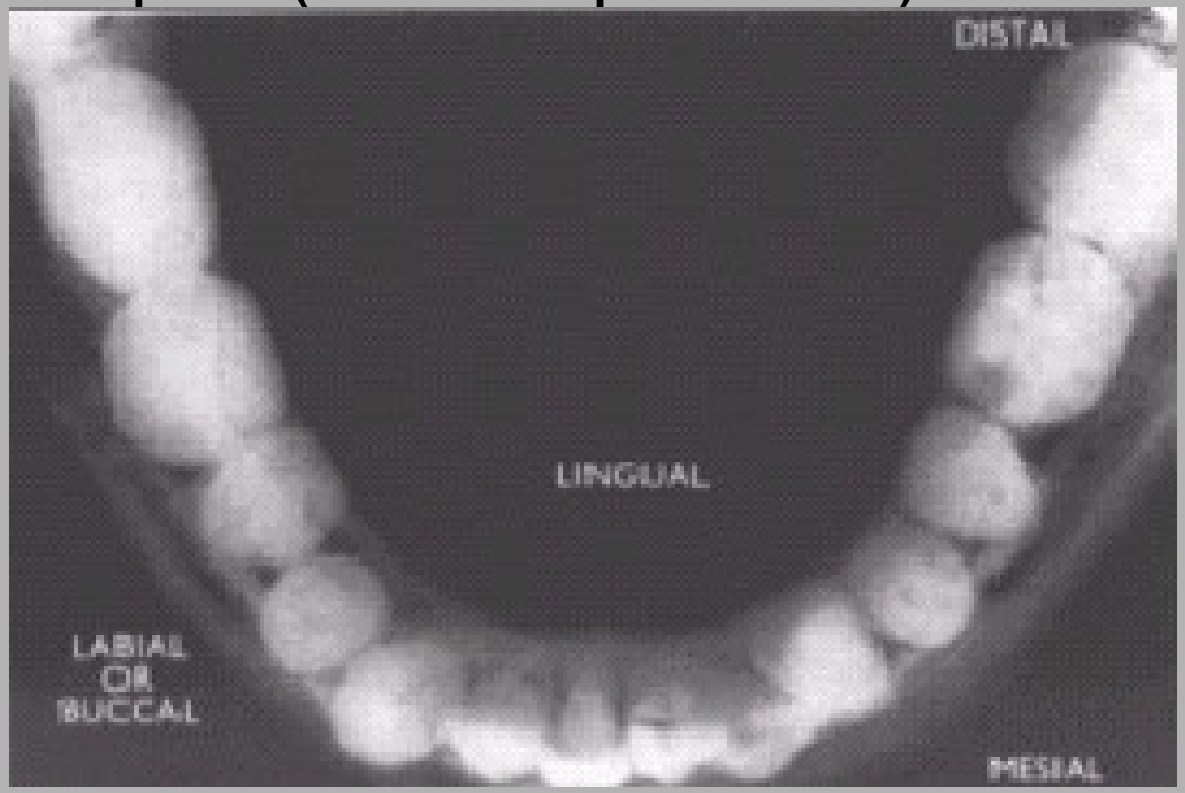
- The head is tilted on heathy side and back.
- The x-ray beam passes through the wisdom tooth towards cranio-ventral oriented film cassette which is on the reverse side.

Chin exposure

- Horizontal placed film
- Imaging toothless chin

Teeth arch

- Parabole
  - frontal part (curved part of parabole)
  - distal part (arms of parabole)



X-ray - attributes

- Electromagnetic radiation of short wavelength produced when high-speed electrons strike a solid target
- Ability to pass through tissues where is partially absorbed

Basic types of radiograms

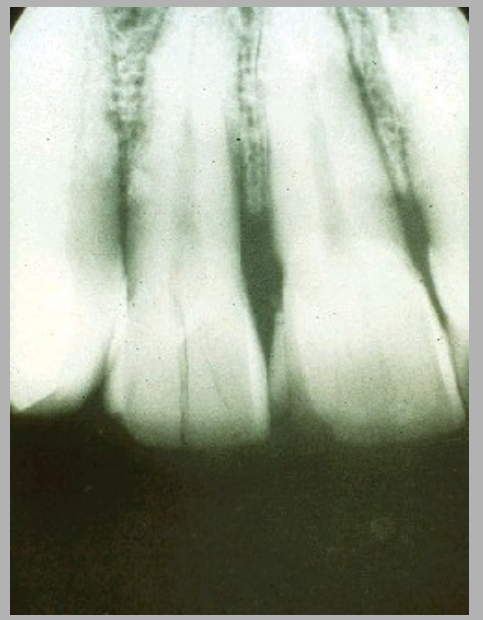
Periapical

Panoramic

Bitewings

Intraoral radiography

- Film/detector is exponated in patient´s mouth
- Small area showing, e.g. a (very) few teeth and part of periodotium

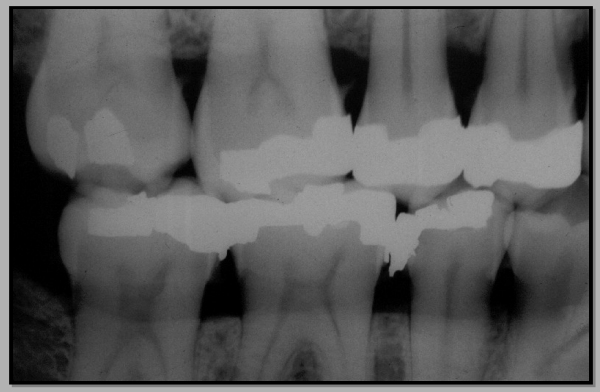


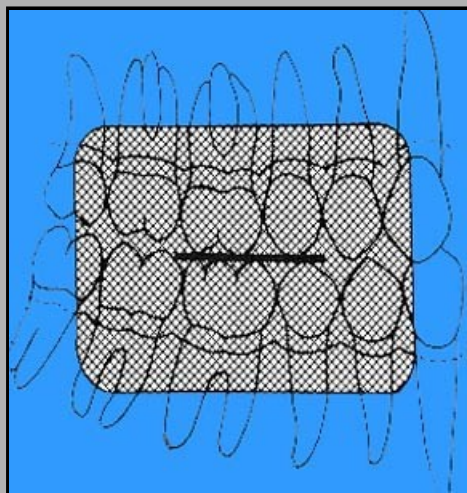
Bitewing

Shows crowns of upper and low jews simultaneously.

Indications:

- examintation of the occlusal line
- examination of:
  - tooth caries
  - tooth loss
  - monitoring pictures, e.g. cured teeth
  - assessment of periodontal condition





Periapical exposures

Indications:

- apical infection detection
- trauma – tooth and alveolus
- root assessment
- orthodoncia – diagnostics, plan, theraphy, follow up

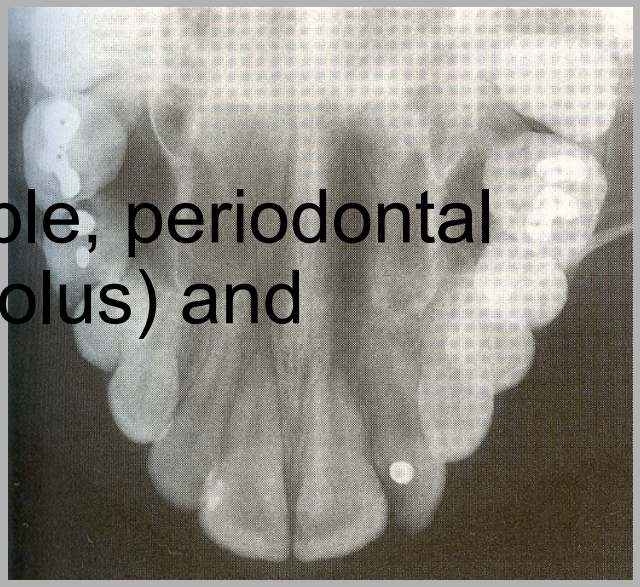
Extraoral exposures

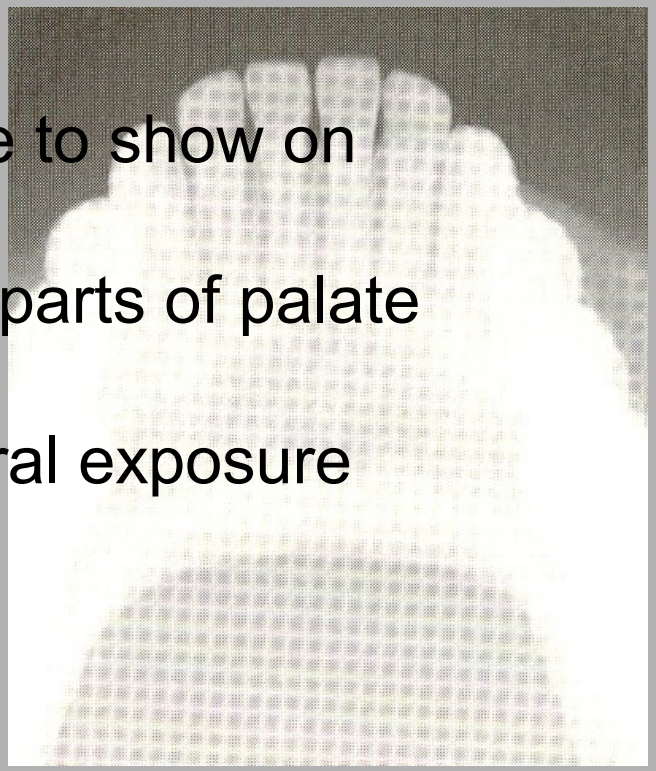
Oclussal exposures

Pictures of maxillar arch, mandible, periodontal ligaments, tooth sockets (alveolus) and adjacent bone

Indications:

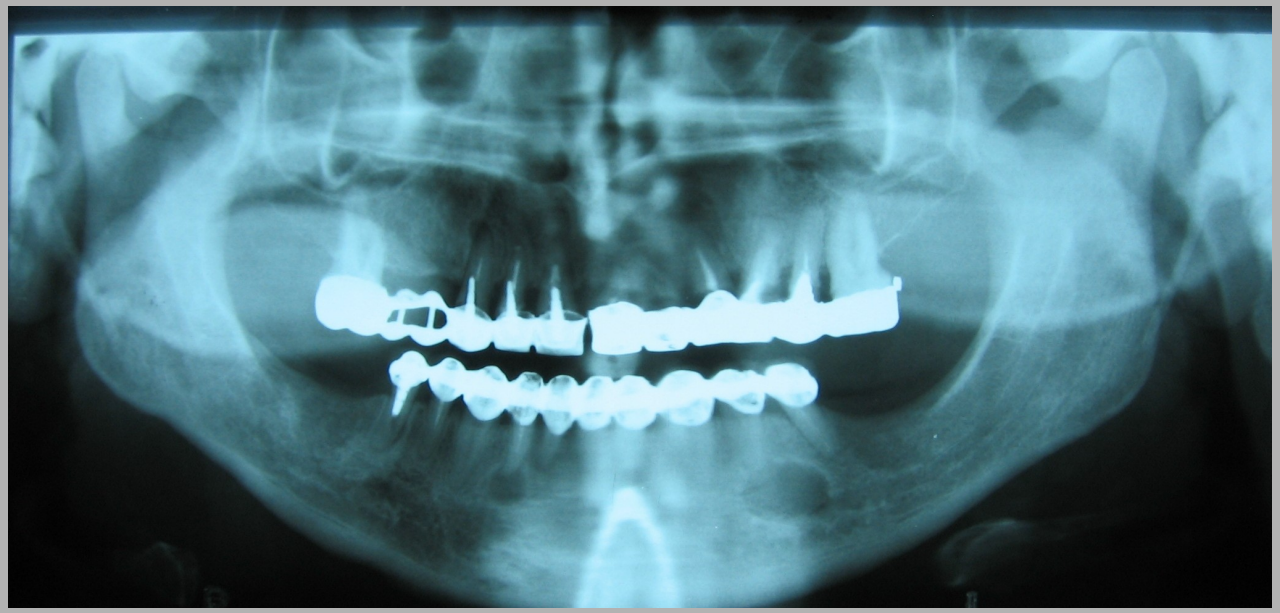
- teeth development monitoring
- redundant teeth
- pathology which is not possible to show on intraoral exposures
- contours of buccal and lingual parts of palate skeleton
- no possibility to perform intraoral exposure
  - limitation of mouth opening
  - no cooperation (children)





Ortopanthomography - OPG

- One exposure demonstrates:
  - jaws
  - teeth
  - joints
  - aleveolar recesses of jaw cavities

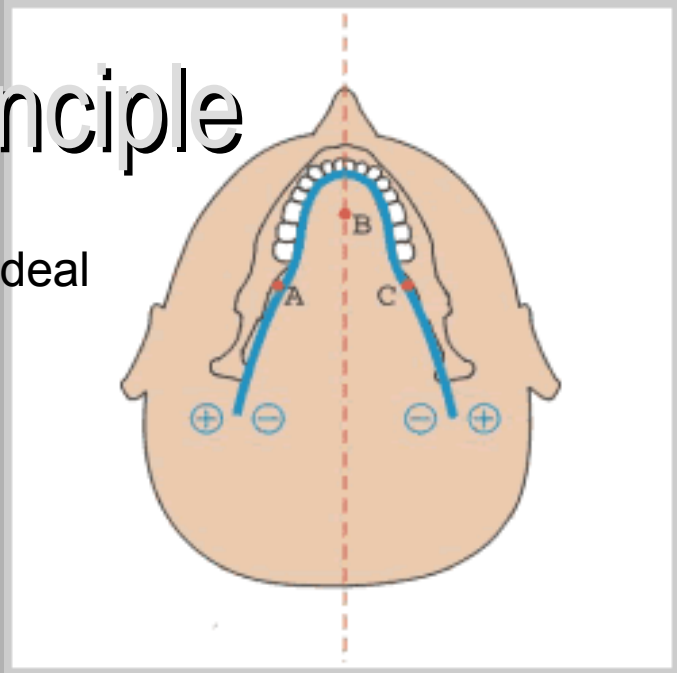


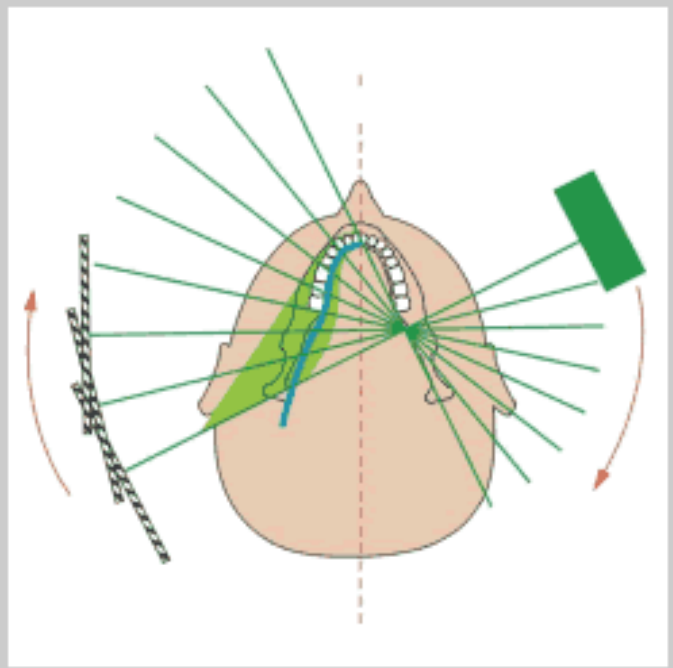
Ortopanthomography - OPG

- Advantages:
  - comfort
  - low radiation dose
  - better than intraoral RTG STATUS (traditional series of teeth)

Ortopanthomography - principle

- X-ray tube goes around the head on the track of ideal teeth occlusion - parabola.
- There are 3 rotatory centra very next to the teeth occlusion.





Ortopanthomography - assessment

- Wisdom teeth
- TMJ
- Maxilar sinus
- Fractures and other skeleton pathology
- Orthodontia

Ortopanthomography - technique

- **Leyer thickness**
  - **thinner leyer = less artefacts, higher radiation dose**
- Defocus
- Zoom
- Possibility of mesuring

Zonograms

- = panoramic RTG exposures of different leyer thickness
- Variable leyer thickness during exposition
- Combination of zoom in (detail) technique
- To better exposure:
  - reduction of cervical vertebra summation
    - ✓reduction of rotating velocity of X-ray tube
    - ✓increase the exposition parameters in the point of (x-ray) passing

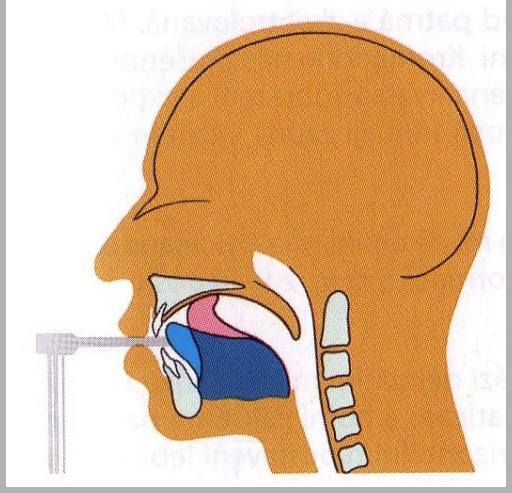
Thickness of the layer

- from 9 mm (frontal part)
- till 20 mm (in the area of TMJ)

Standard exposure in normoposition

- you could explain the course of the examination to the patient
- remove metal (ear rings,…, orthodontal devices, piercing)
- right posture, let shoulder down

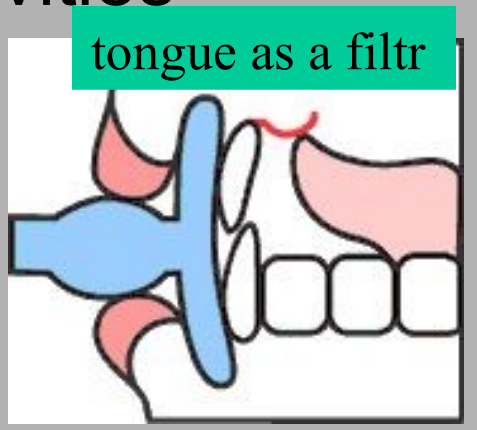
Burn-out effect



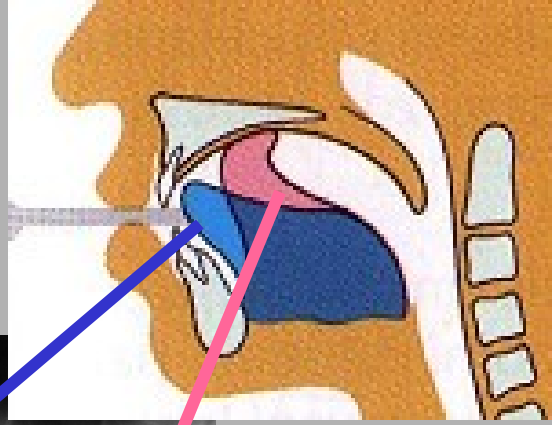
- incorrect tongue position
- x-ray beam is not reduced

= „overexposition “ of structures

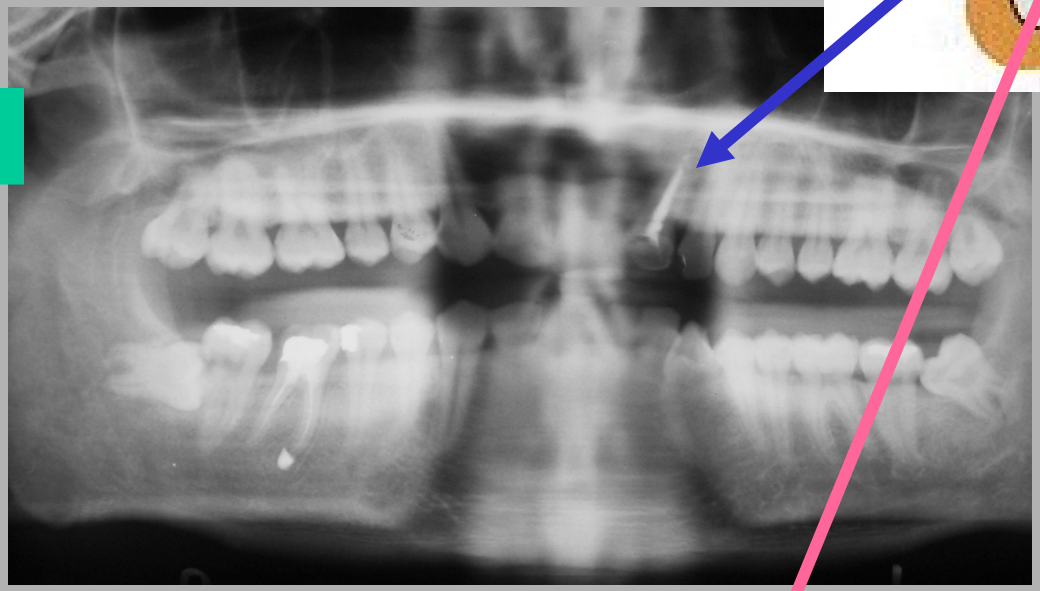
- **negative contrast of air** suppresses:
  - maxillar tooth roots
  - structures of maxilla
  - boundary of nasal and maxillar cavities
- **it is NOT possible to ASSESS**



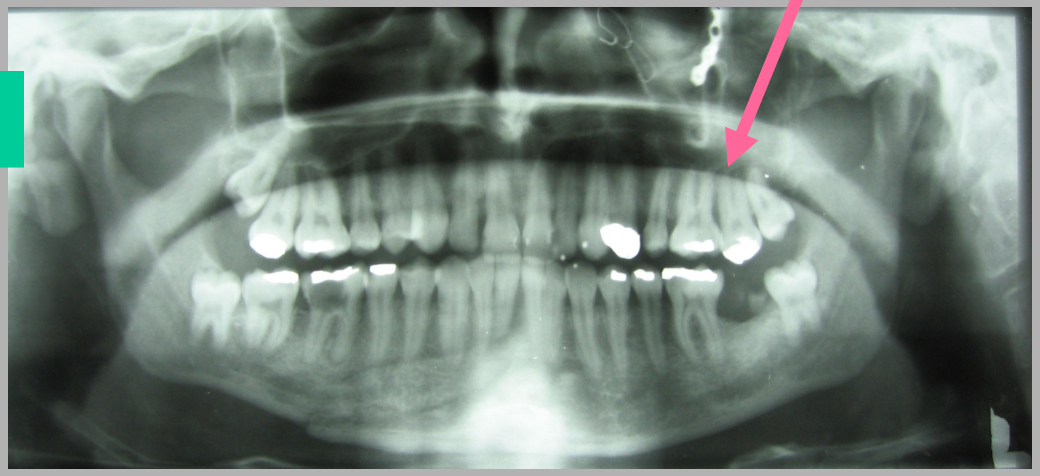
Burn-out effect



overexposed picture



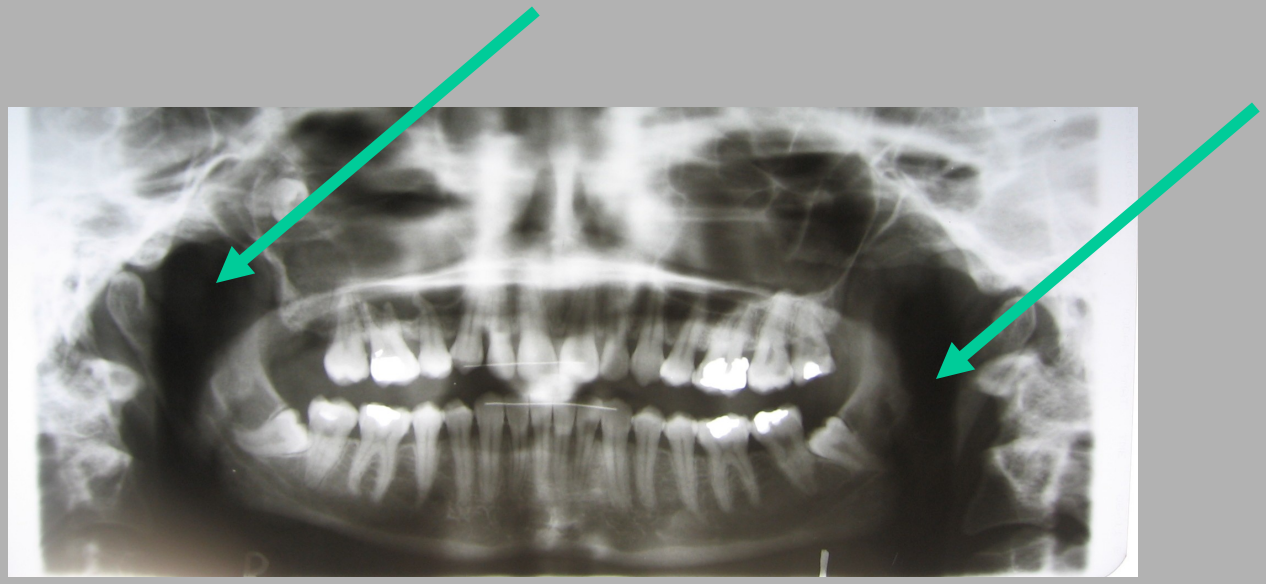
tongue as a filtr



The breathing

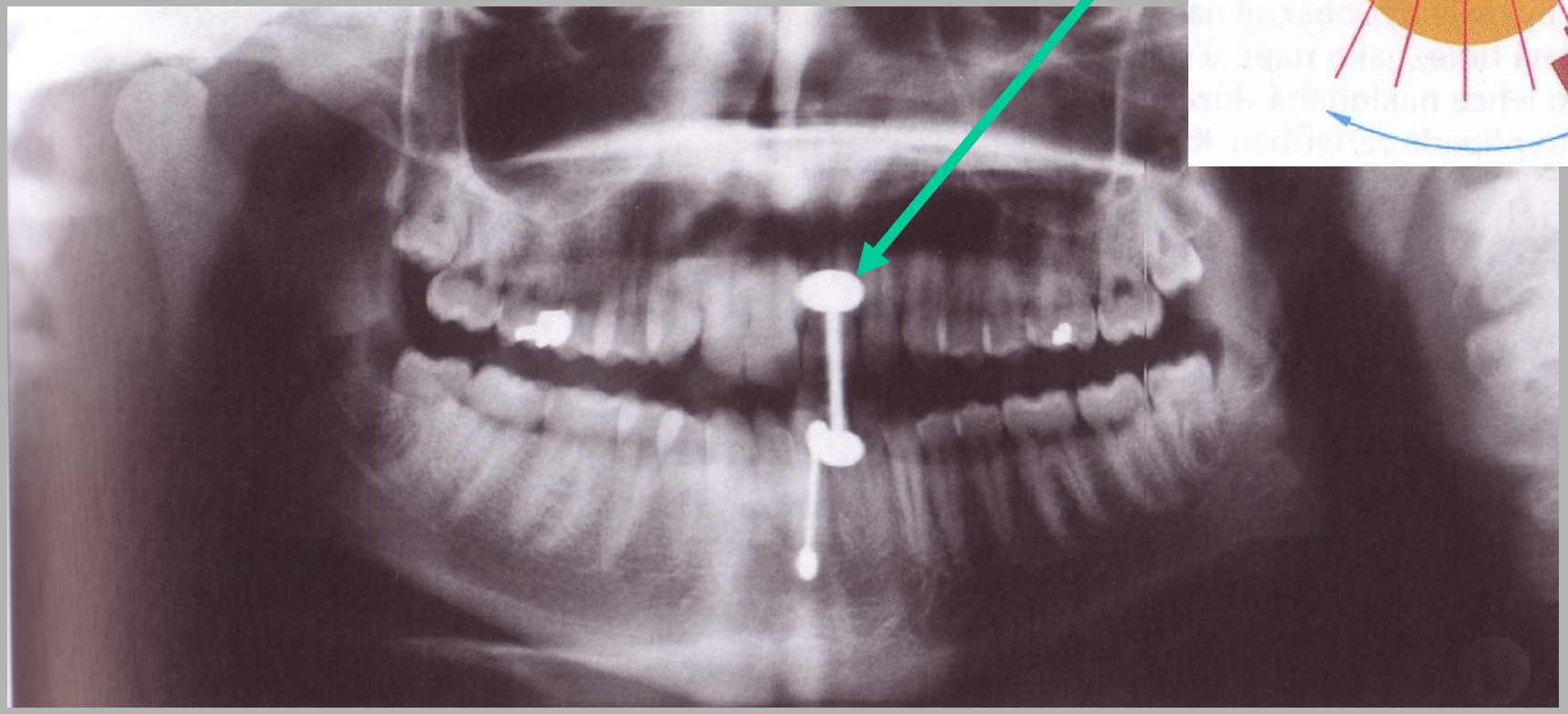
„Don´t move and breathe calmly during the examination.“

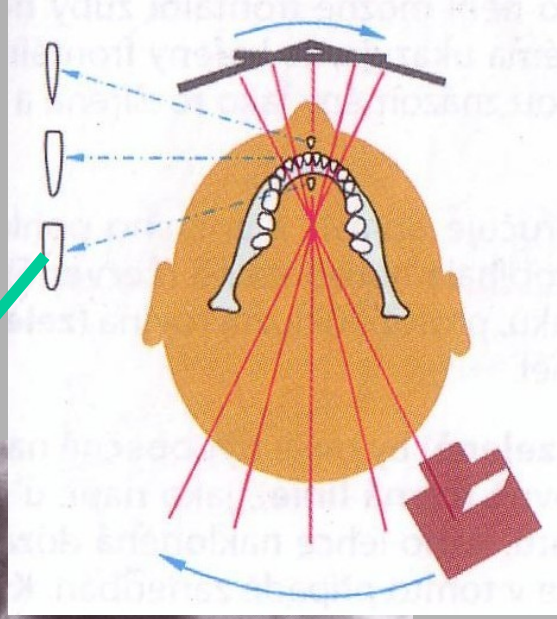
- deep breath and hold breath
- epipharynx is filled up with the air
  - incorrect exposure of lateral part of picture



Pictured layer

piercing - tongue

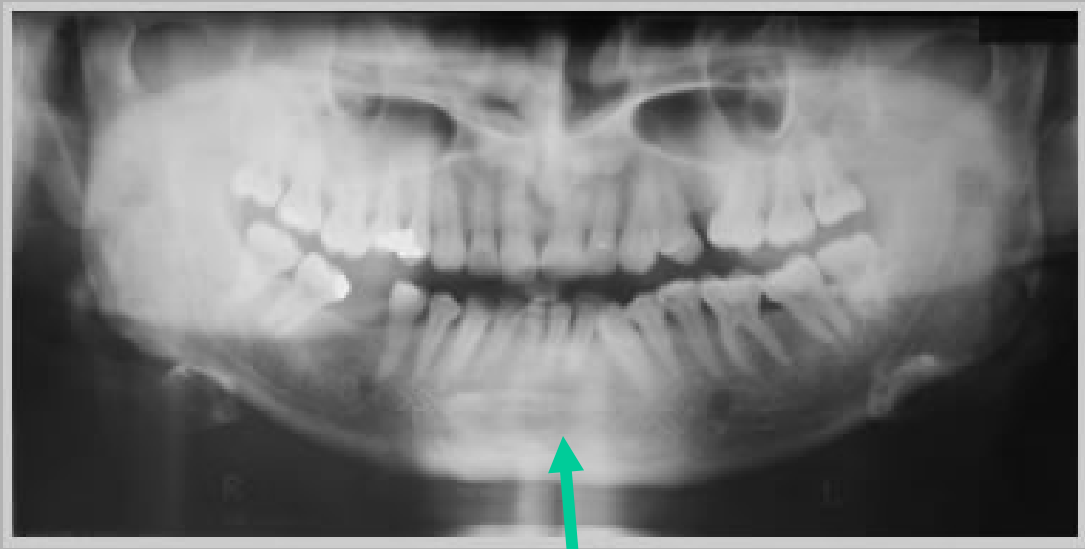




piercing - lip

Ortopanthomography - mistakes

- The head hang (down)
- The roots of caudal incisors are deviated of the plane
- Out of focus



http://www.dentalcare.cz/odbclan.asp?ctid=auth&arid=425

Ortopanthomography - mistakes

- Tilting the head back
- The root of cranial incisors are deviated of the plane
- Out of focus

http://www.dentalcare.cz/odbclan.asp?ctid=auth&arid=425

Ortopanthomography - mistakes

- <u>The head is too close to the film</u>
- The teeth in both jaws
  - are smaller
  - out of focus
- The cervical vertebras could summate with mandible arms

http://www.dentalcare.cz/odbclan.asp?ctid=auth&arid=425

Ortopanthomography - mistakes

- <u>The head is far from the film</u>
- Maxillar and manbidular teeth are:
  - out of focus
  - larger
- There are not on the picture mandible joints

http://www.dentalcare.cz/odbclan.asp?ctid=auth&arid=425

Pathology

Tartar

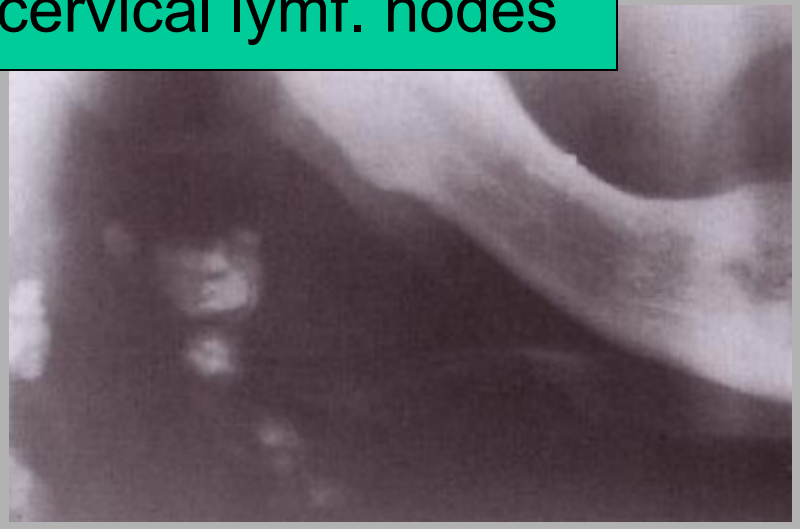
tartar is composed of mineralized tooth plaque + generalized bone reduction as a consequence of parodont pathology

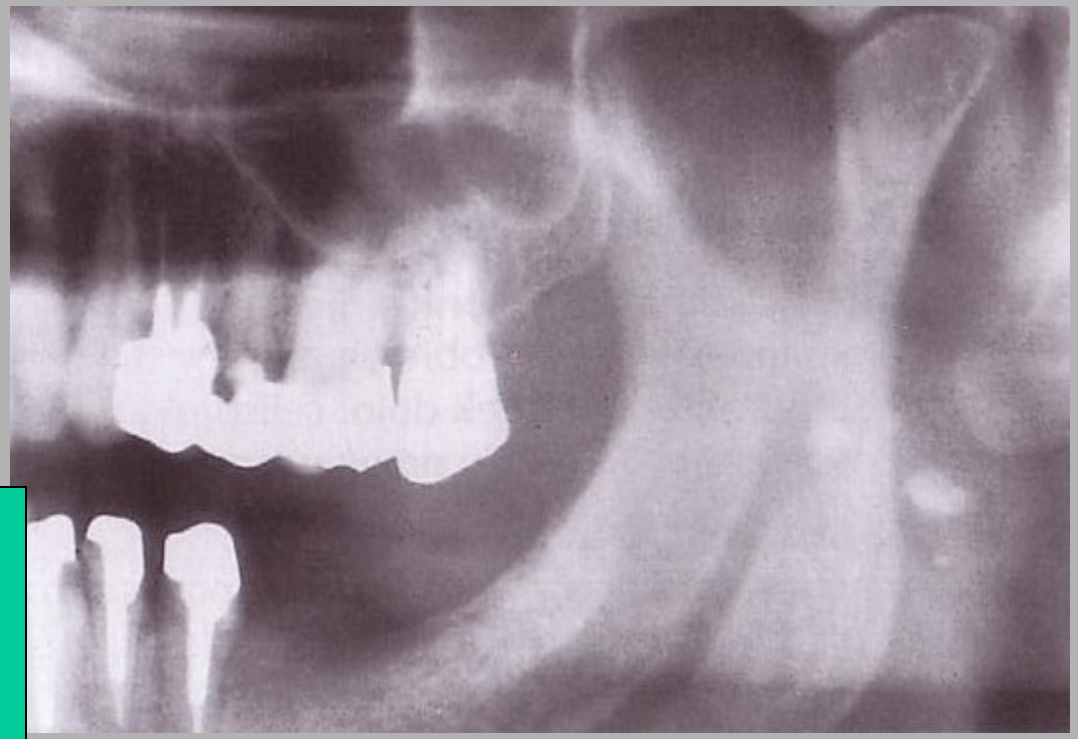
- Origins in area of outfall of main salivary glands
- Calcium phosphate
  - x-ray opacity

parodontitis marg. profunda
sublingual tartar

Concrements

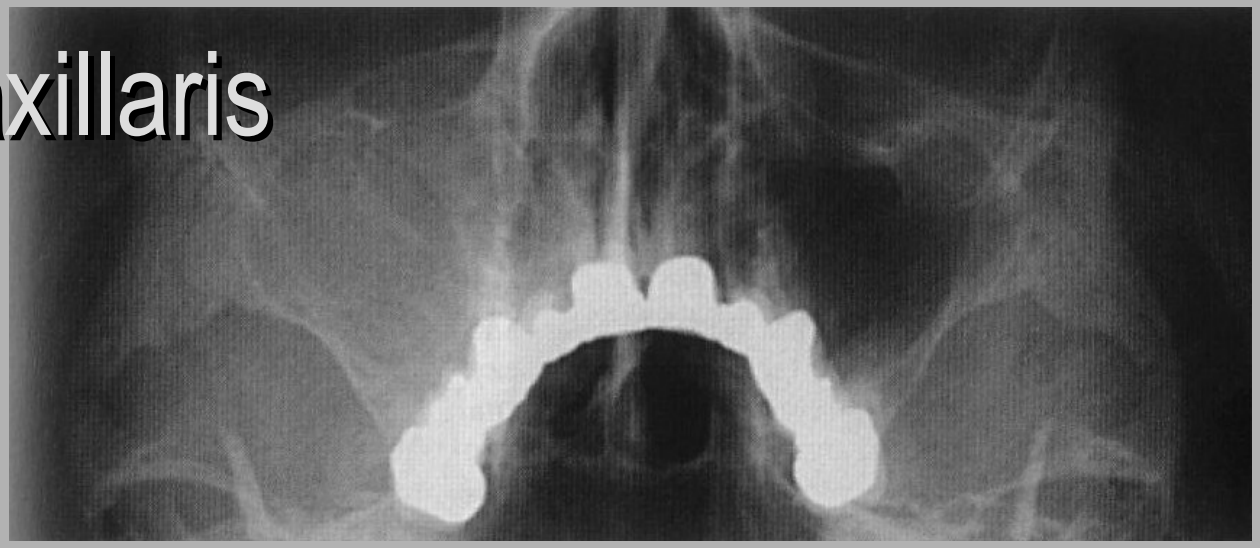
calcified cervical lymf. nodes

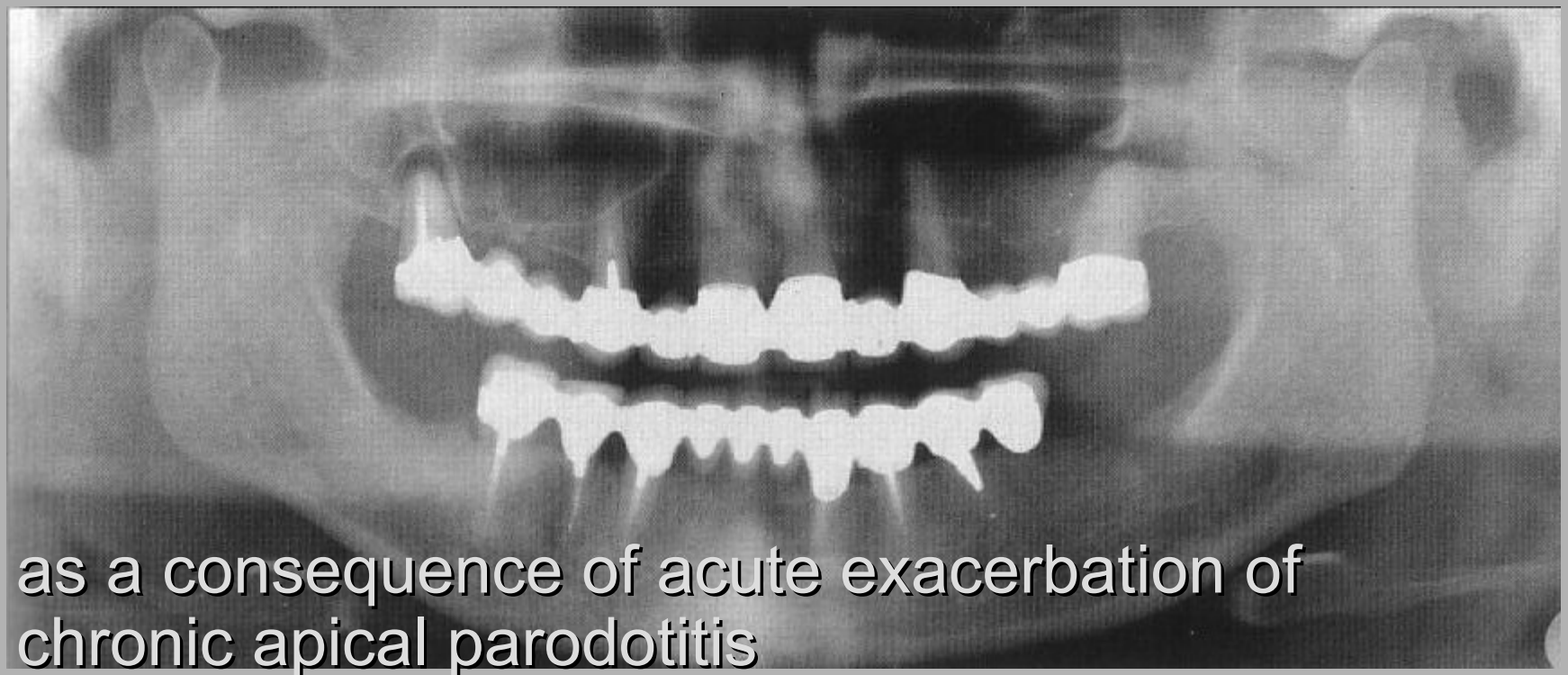




calcification of gl. parotis as a consequence of parotitits epidemica

Sinusitis maxillaris

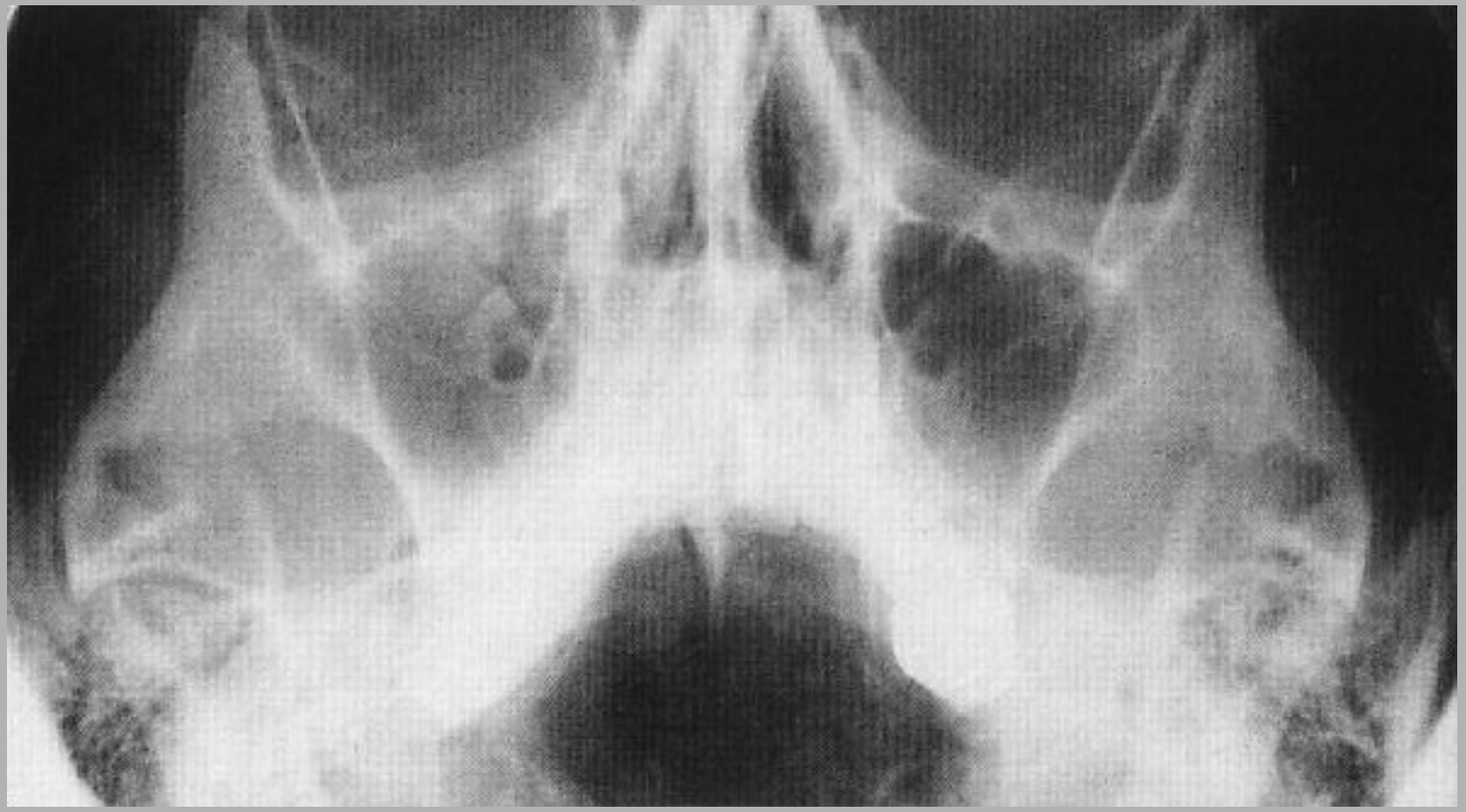




- as a consequence of acute exacerbation of chronic apical parodotitis

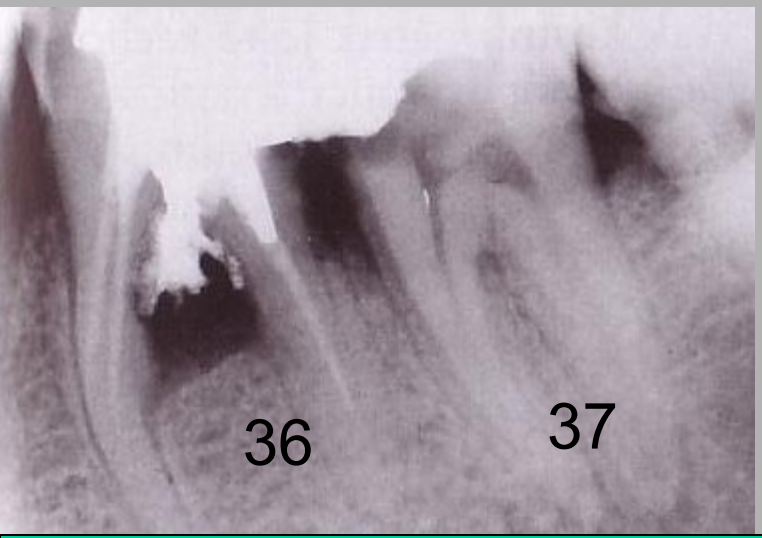
Sinusitis maxillaris

- acute catarrhal etiology



Marginal parodontopathy

bone reducion between 35,37
as a consequence of amalgam overhang
caries 34,37,38



mesial posttraumatic
central granuloma

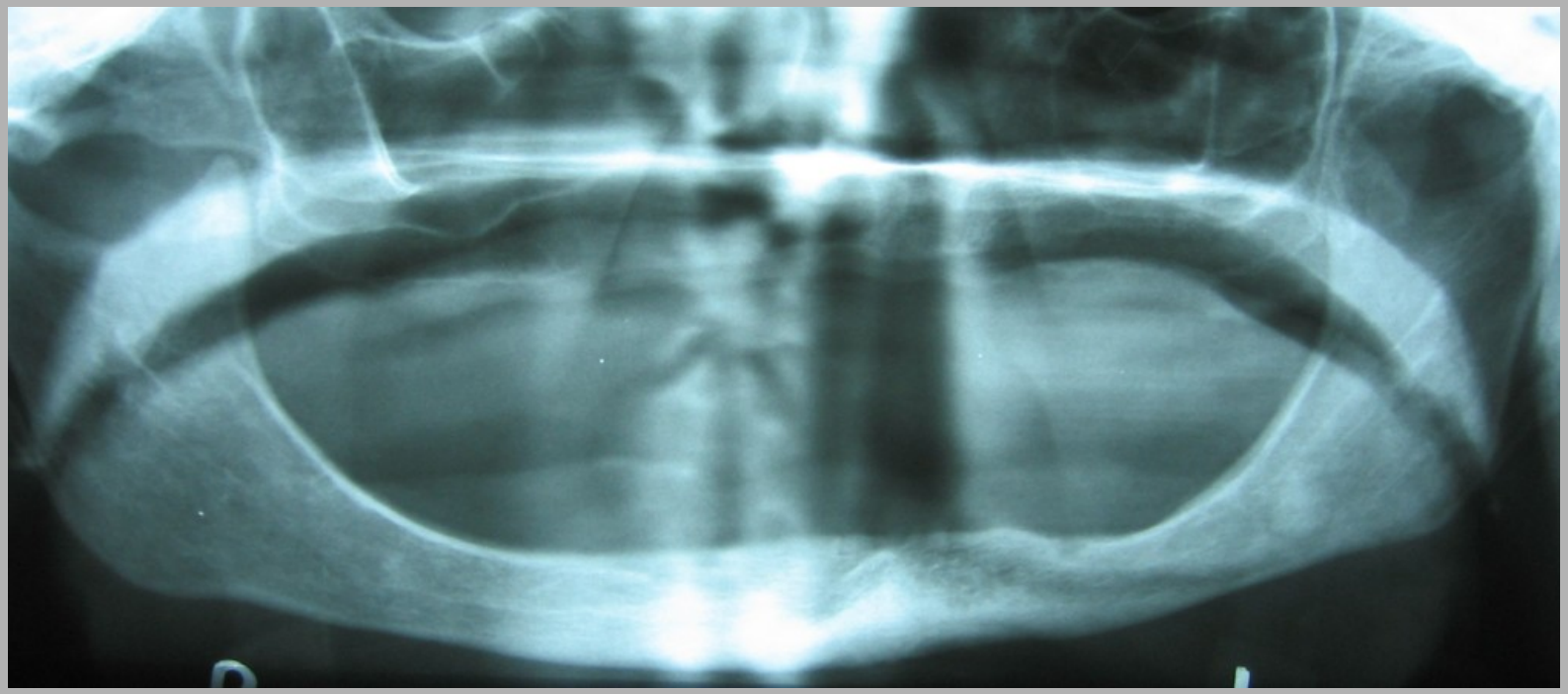
oversupply of root filling
injury to the desmodont and mozodont of tooth root
etiology: via falsa
= interradicullar bone loss

Marginal parodontopathy

traumatic occlusion
etiology: fixed bridgework (quadrant 3)
massive bone reduction
sclerotic reactive zone - apically (36,37)

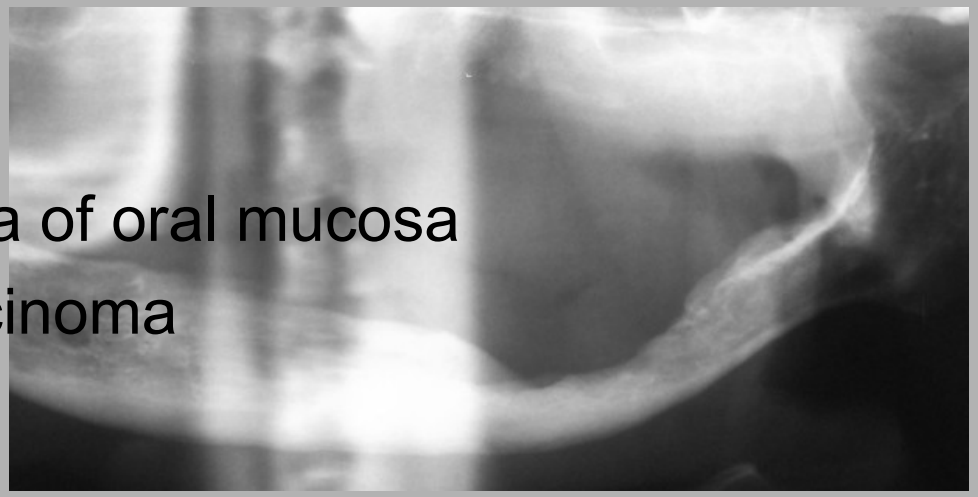
Marginal parodontopathy

alveolar and mandible bone reduction
old age

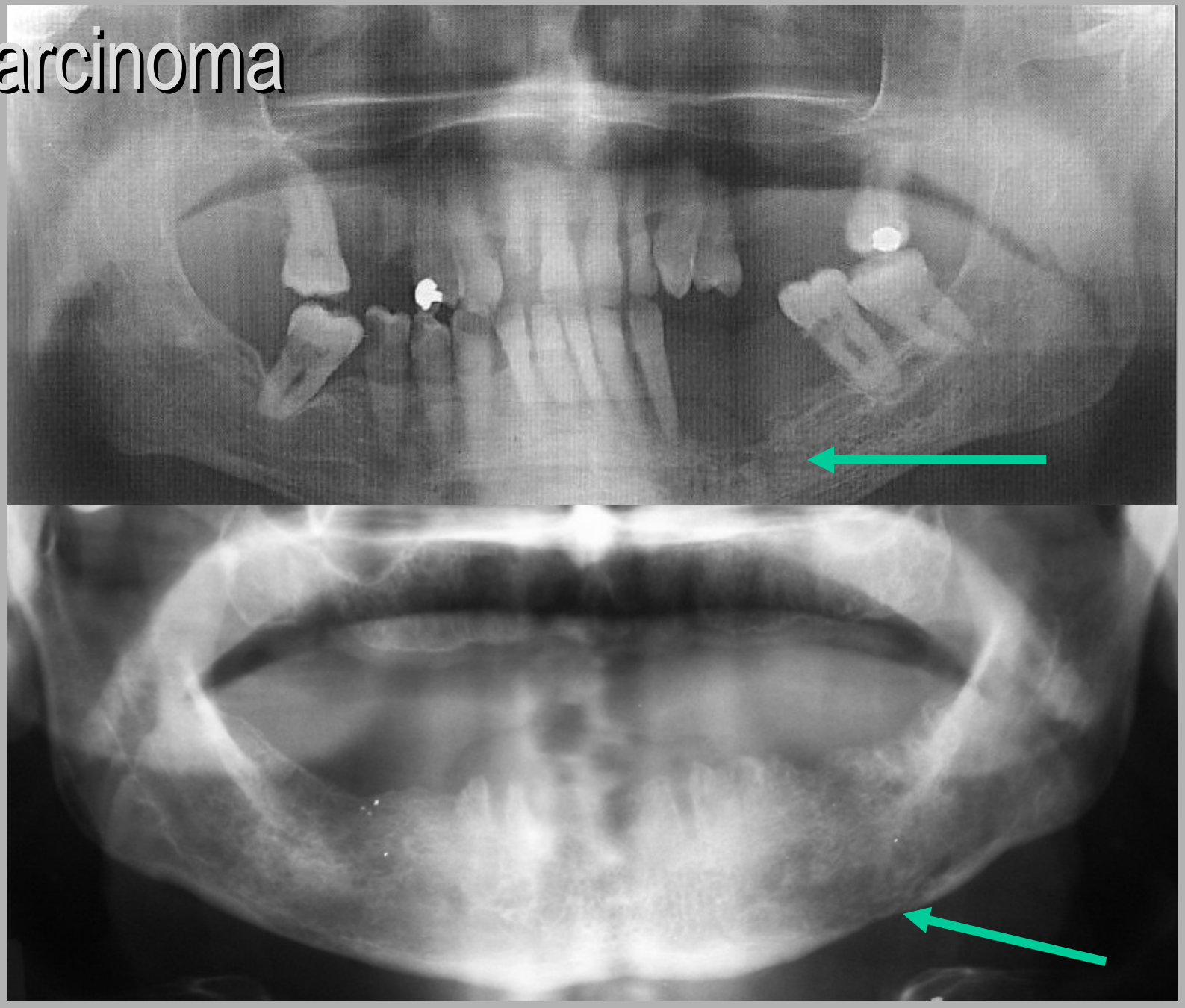


Carcinoma

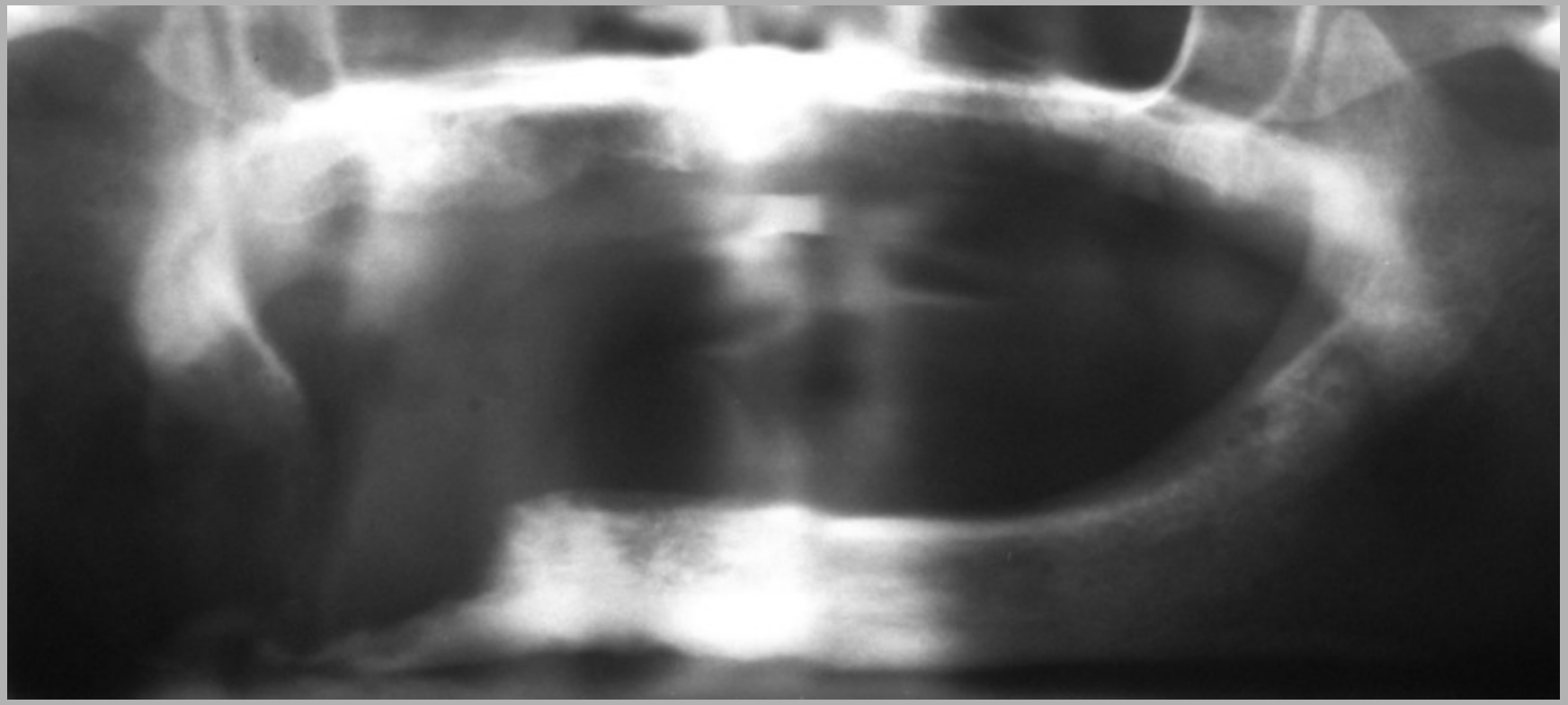
- the most often carcionoma of oral mucosa
- intraepitelial mucosal carcinoma
- infiltration of:
  - adjacent bones
  - lingual part of mandible
- osteolysis
- parestesis
- smokers, older age



Carcinoma



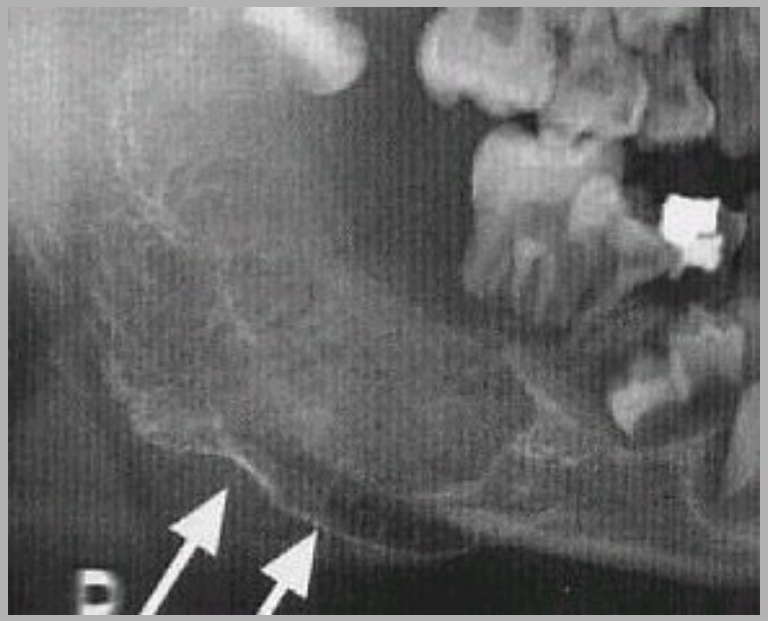
Carcinoma



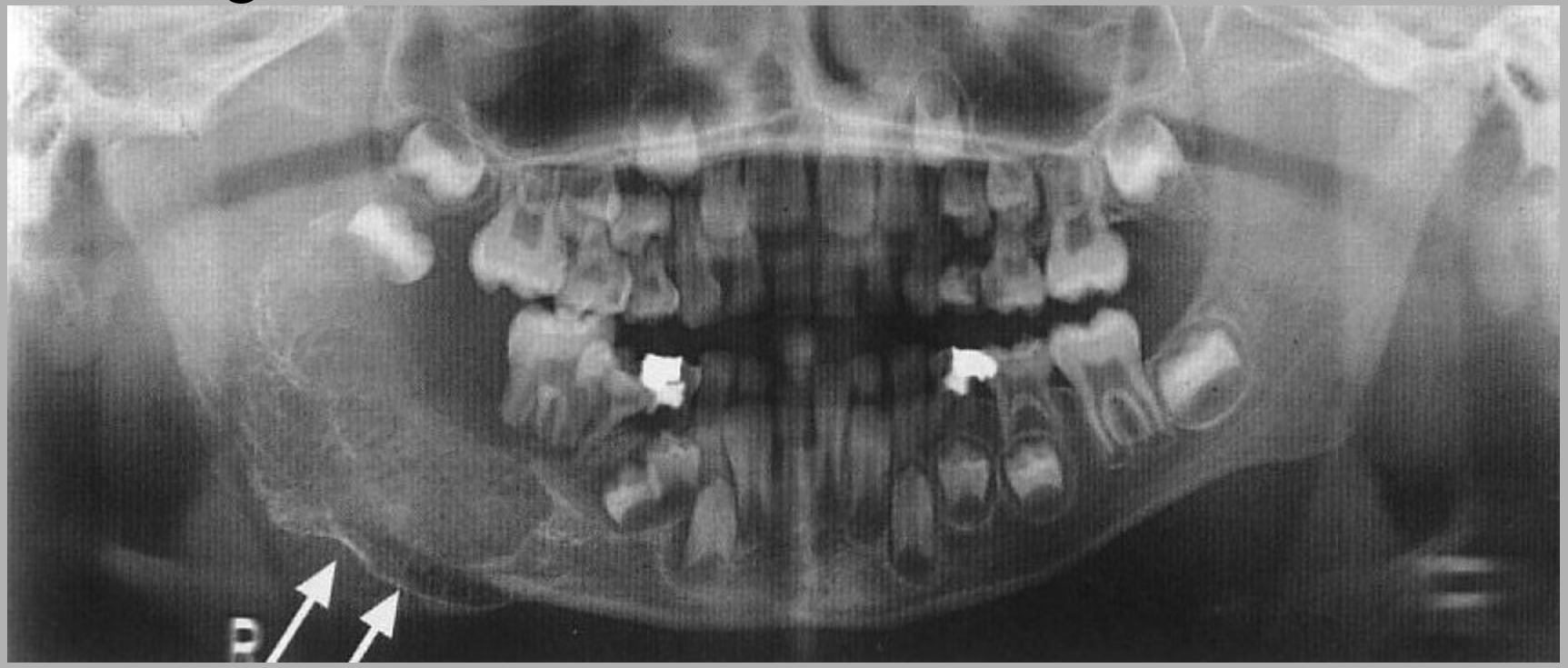
Ewing sarcoma

- children 10-20 year old
- high grade malignant
- fast grow
- soon metastatis
- angle of mandible
- painfull
- X-ray: „slices of onion“
- Dif.dg.
  - osteosarcoma
  - endosteal hemangioma

gold diagnostic standard
MRI



Ewing sarcoma



- boy, 7 year old
- difficulty clinics
- oedema of low jaw
- movement of teeth
- periost reaction

Osteosarcoma

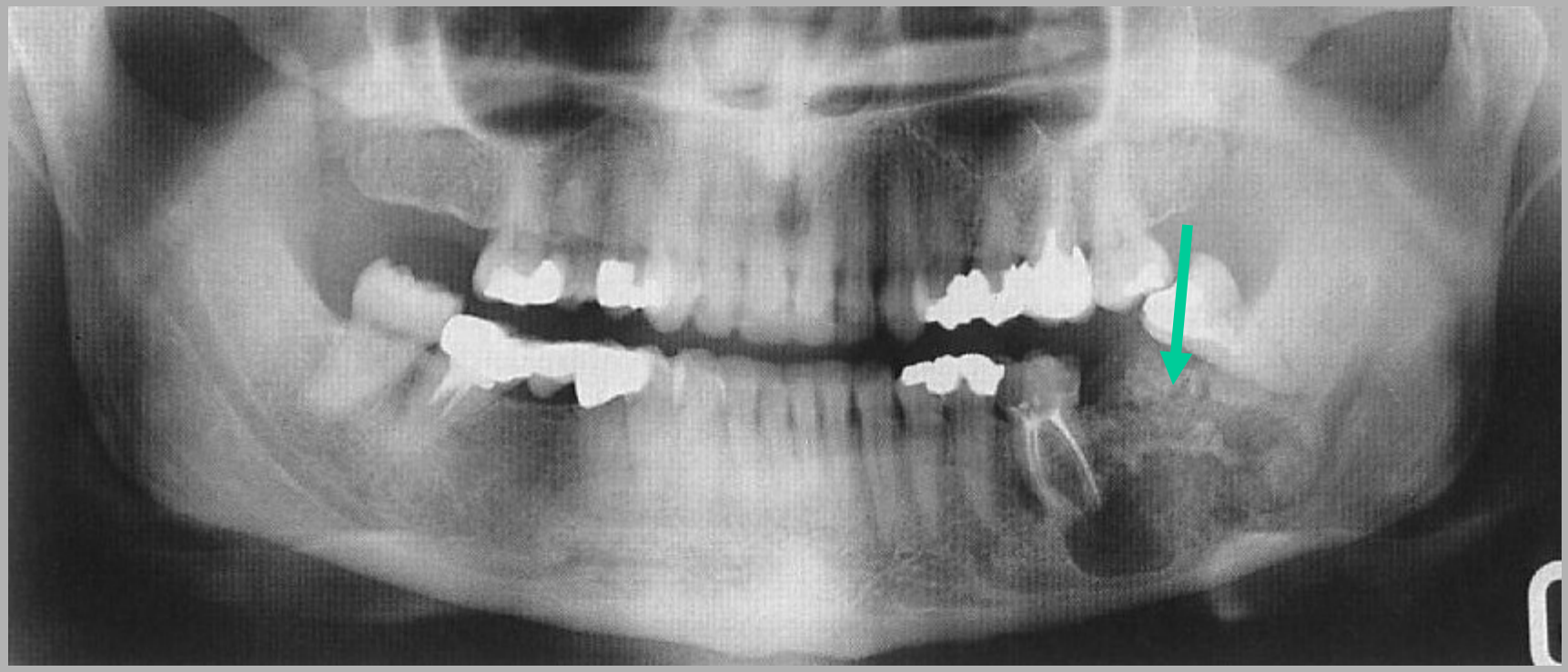
- 2. and 3. decennium
- mezenchymal tumor
- histologic
  - osteoblasts
  - chondroblasts
  - fibroblasts

RTG

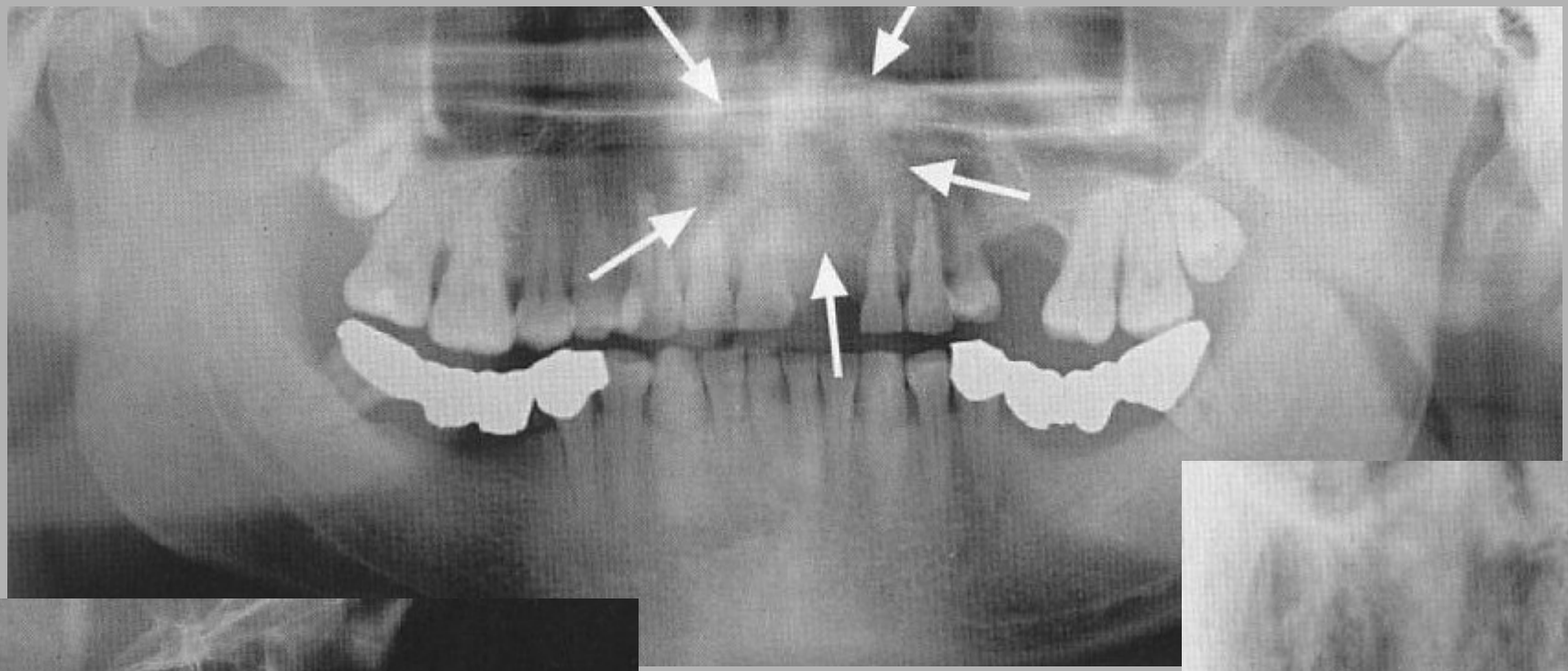
- osteoblastic + osteolytic

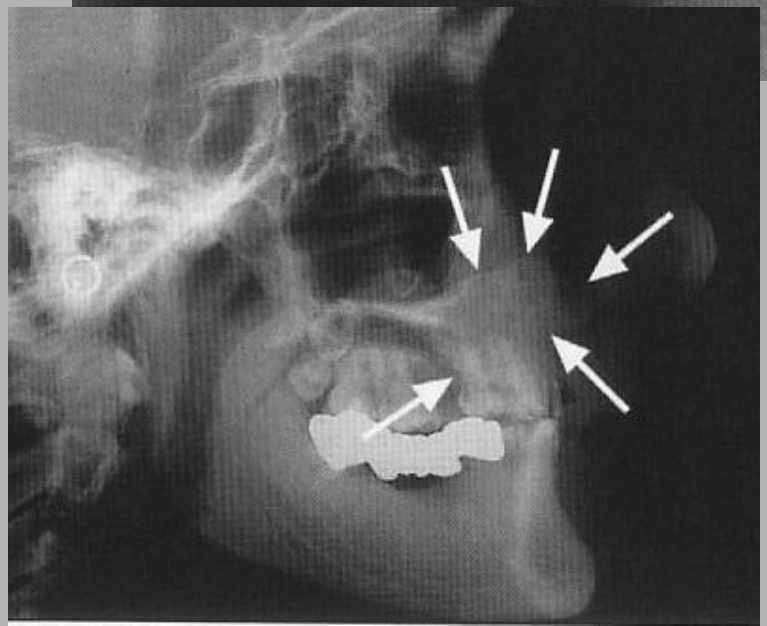
– various image

Osteosarcoma



Osteosarcoma

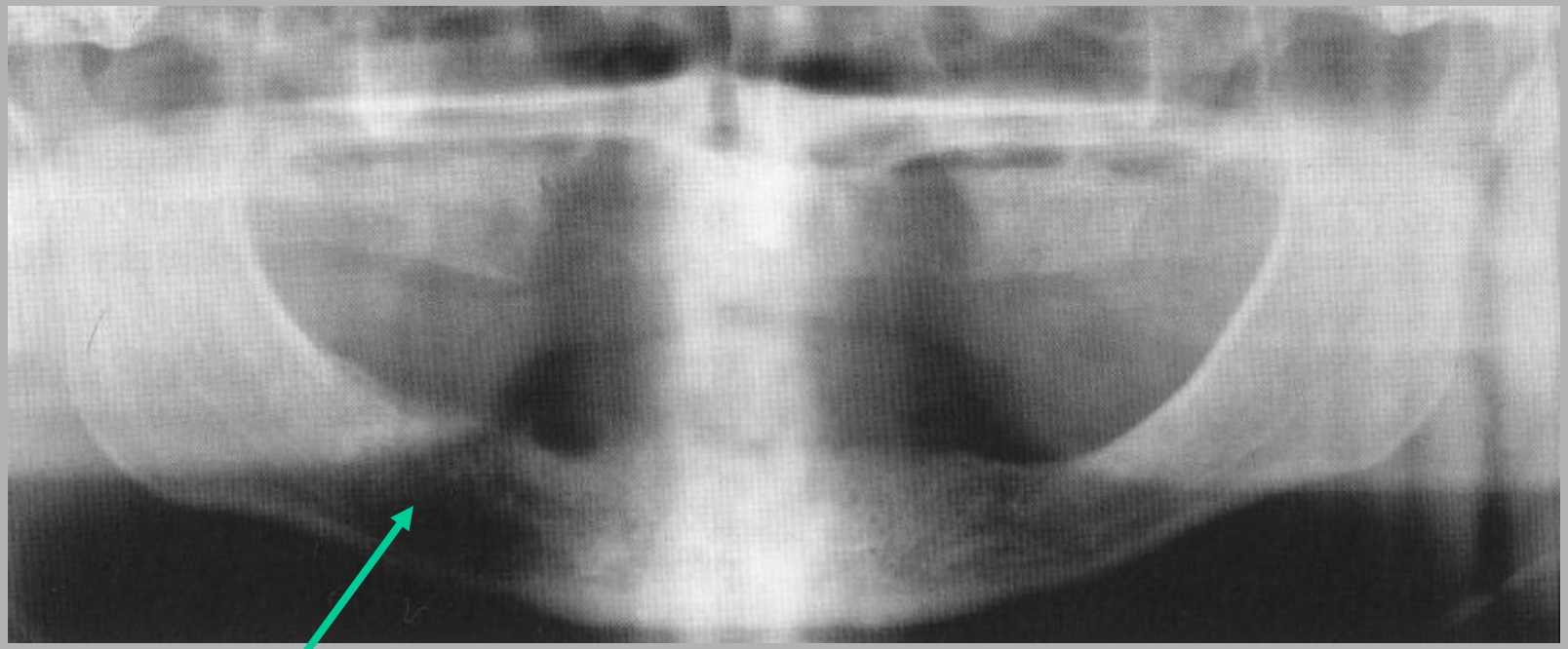




Metastasis

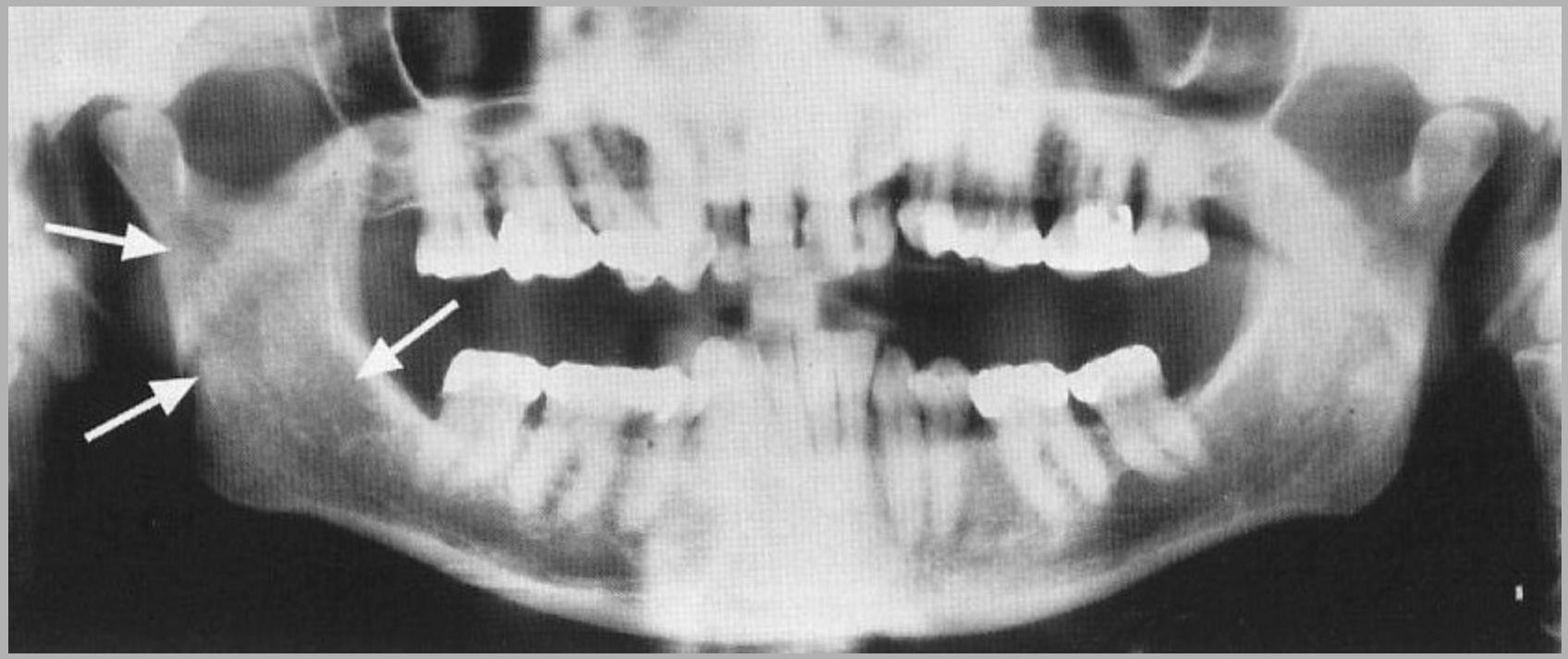
- carcinomas of:
  - mamma
  - lung
  - gl. thyreoidea
  - prostate
- blood spread
- clinics:
  - pain in the bones
  - „reasonless“ teeth release
  - parestesis of lower lip
  - patological fracture
- <u>suspicion = scintigraphy</u>

Metastasis



- prostate carcinoma
- transparency

Metastasis



- bowel carcinoma
- spotted, blurred

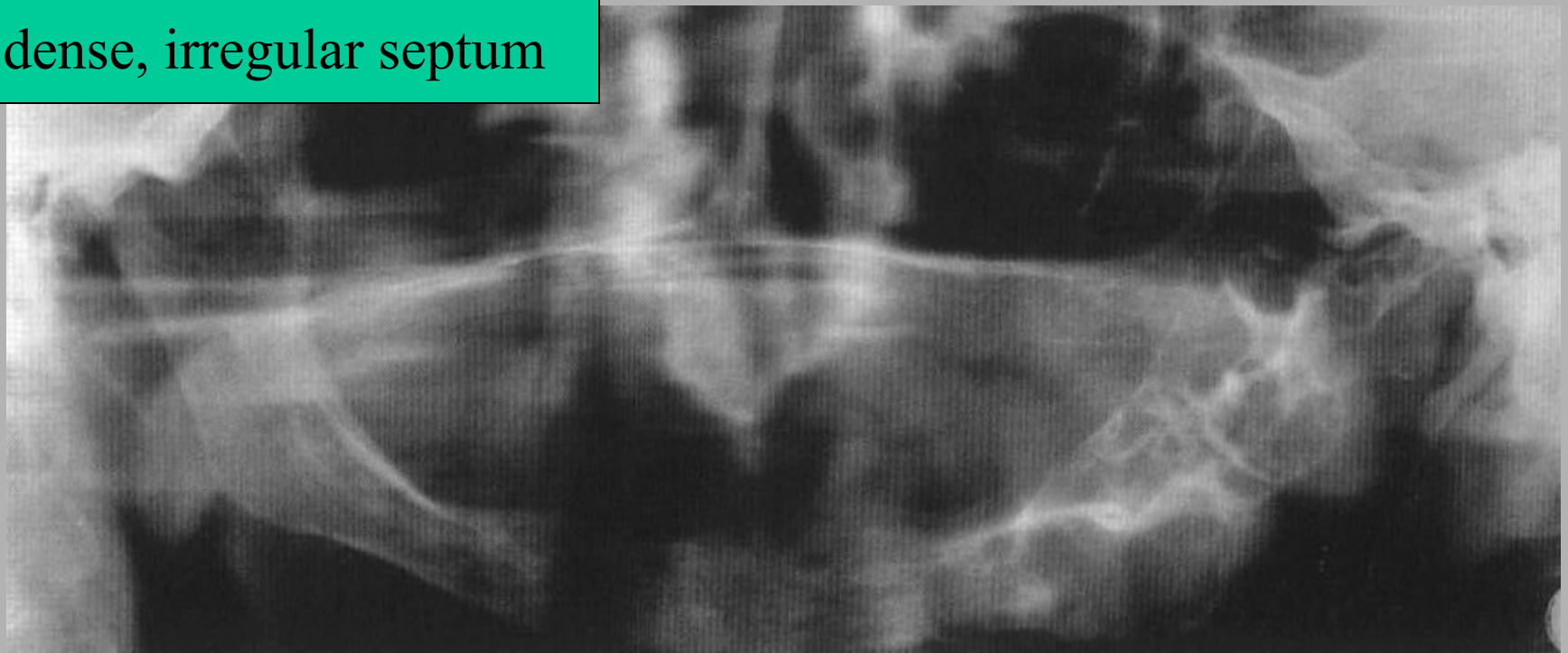
Odont. myxoma

- age 10-50 y
- female/male 1:1
- jaws (only)
- most often in lower jaw - caput of mandible
- growth
  - fast
  - endosteal
  - muscle infiltration (occasionally)
- good bounded, irregular translucency
- often relaps

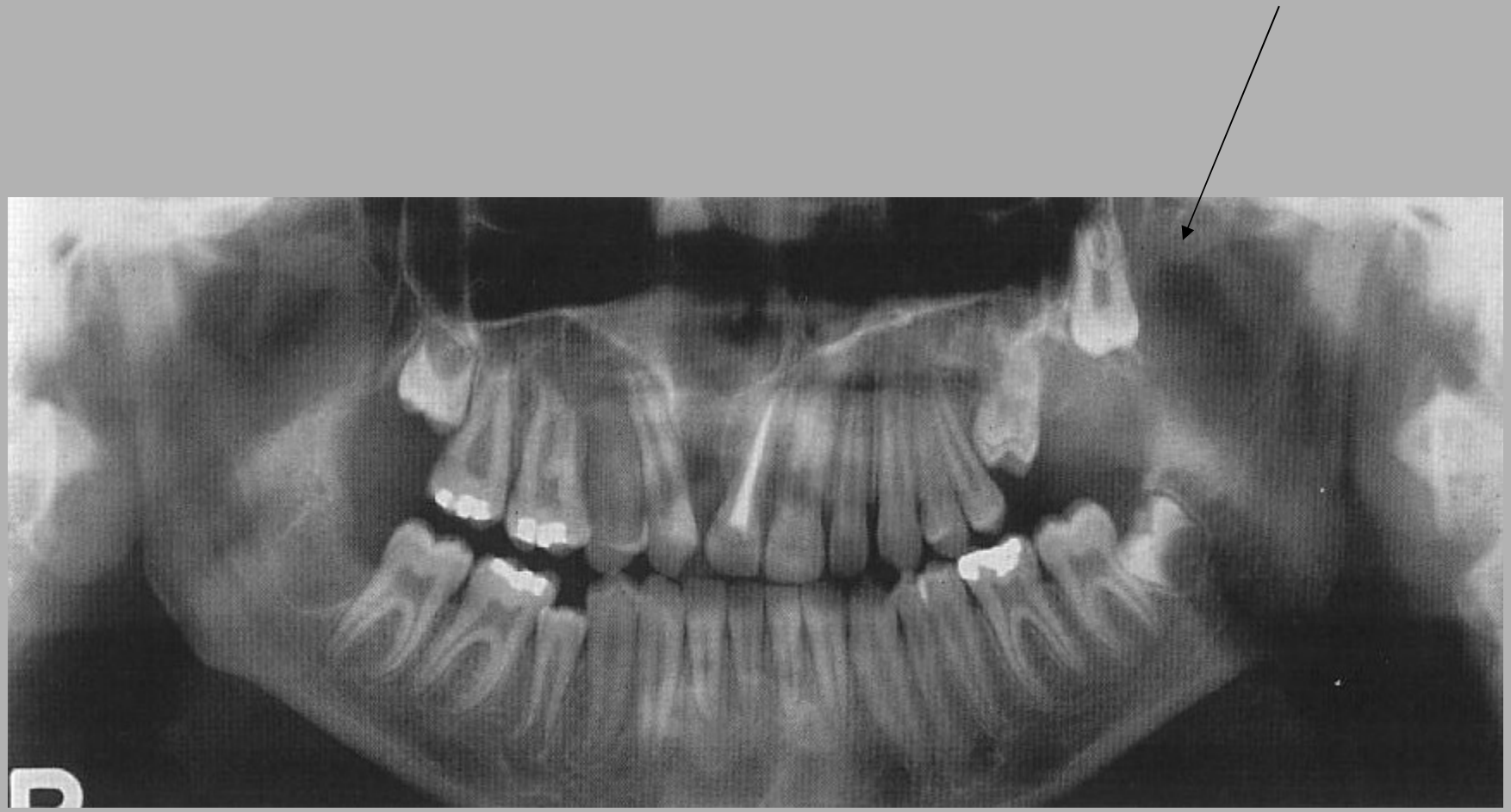
Odont. myxoma

structure - net

dense, irregular septum



Odont. myxoma



Odontoma

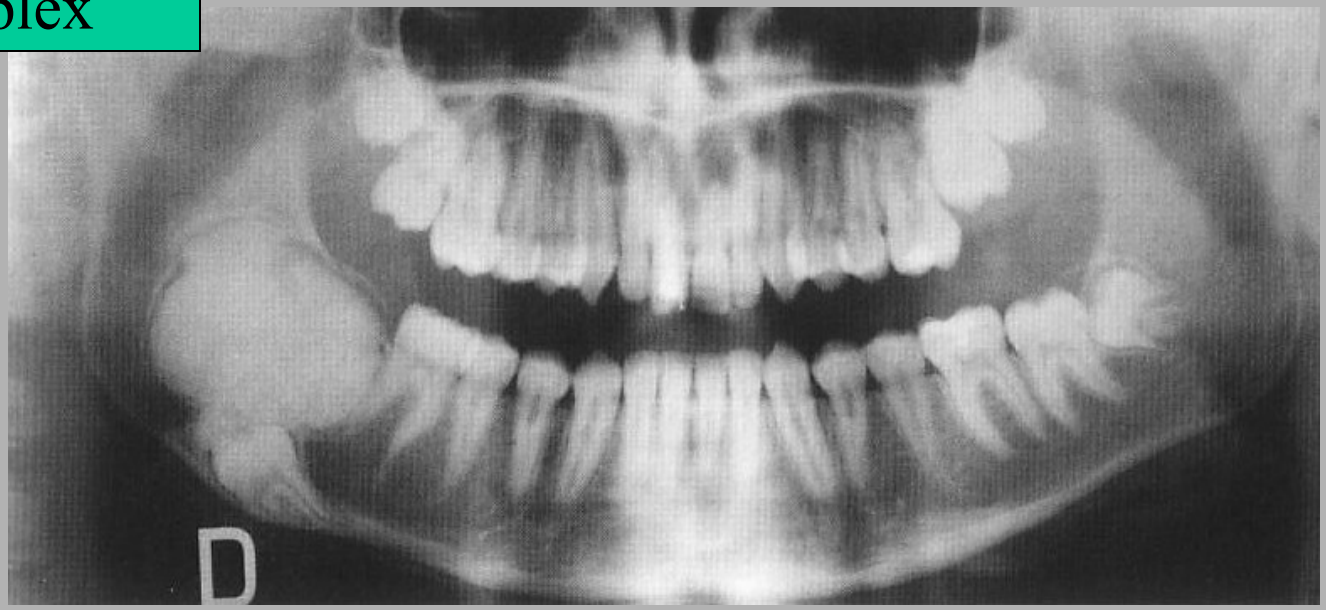
- simillar to the hamartomas
- conglomerate of various teeth tissues
  - composite odontoma
    - ✓contains several devoloped teeth
  - complex odontoma
    - ✓contains basic teeth tissues in amorphous mass

composite

complex

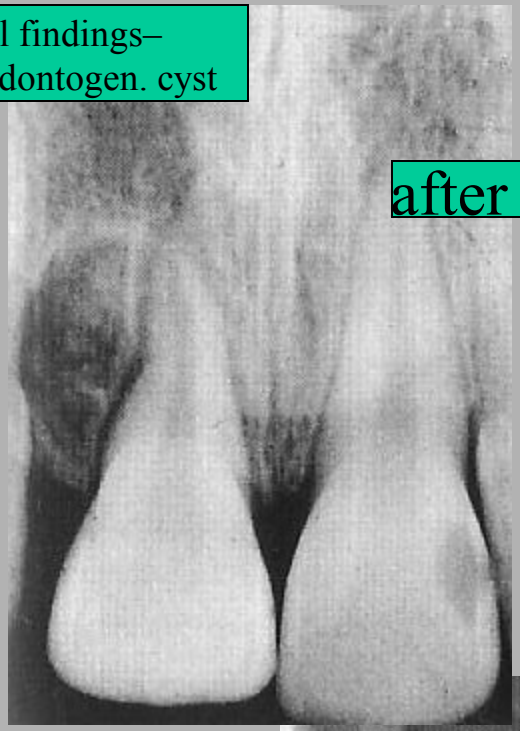
Odontoma

complex

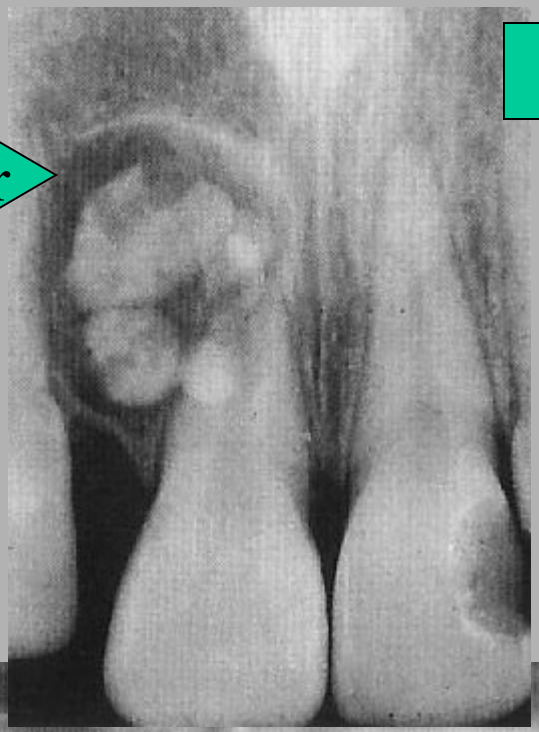


Odontoma

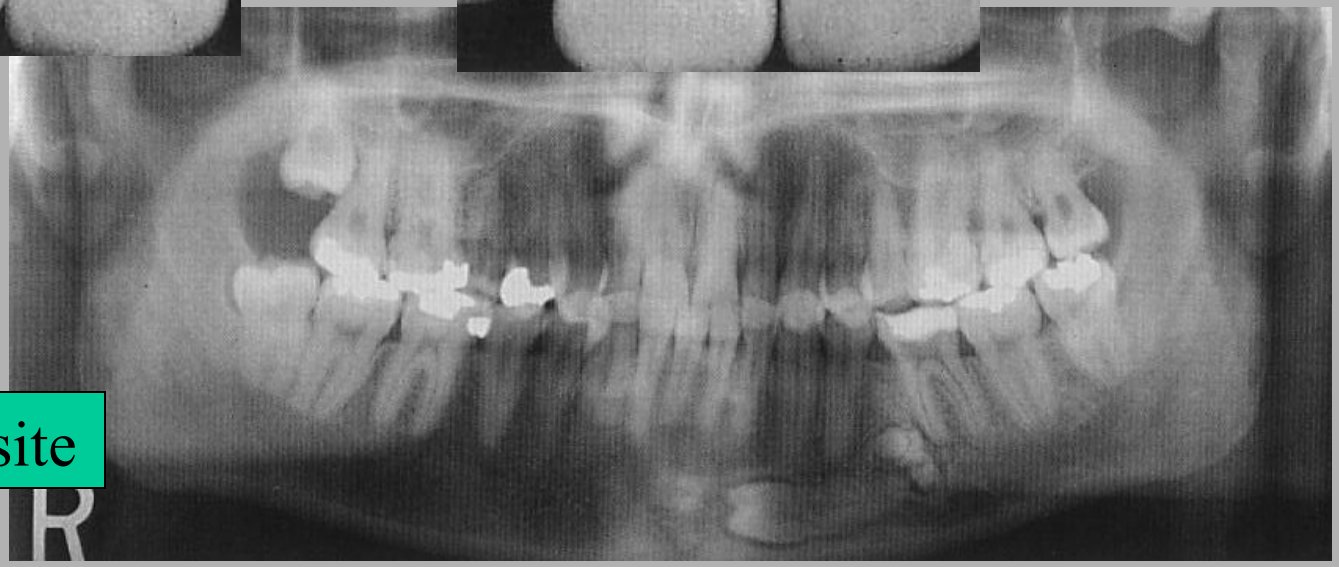
incidental findings–
susp. calc. odontogen. cyst



after 2,5 year



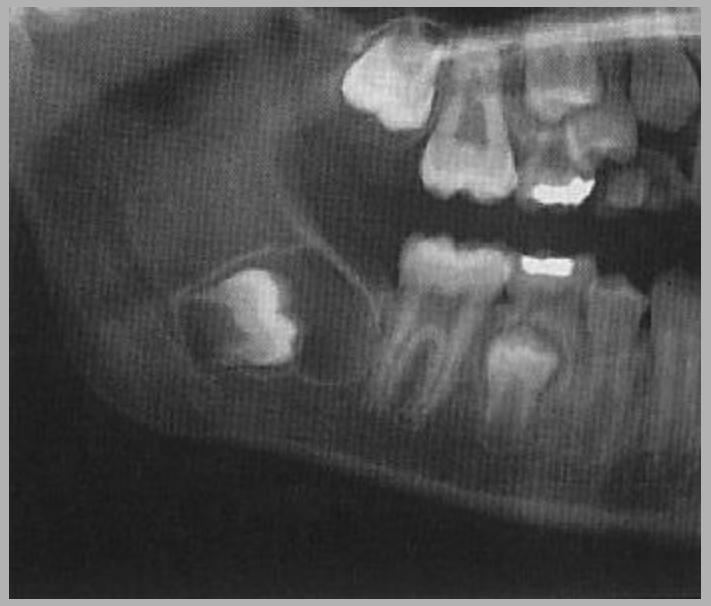
composite



composite

Ameloblastic fibroma

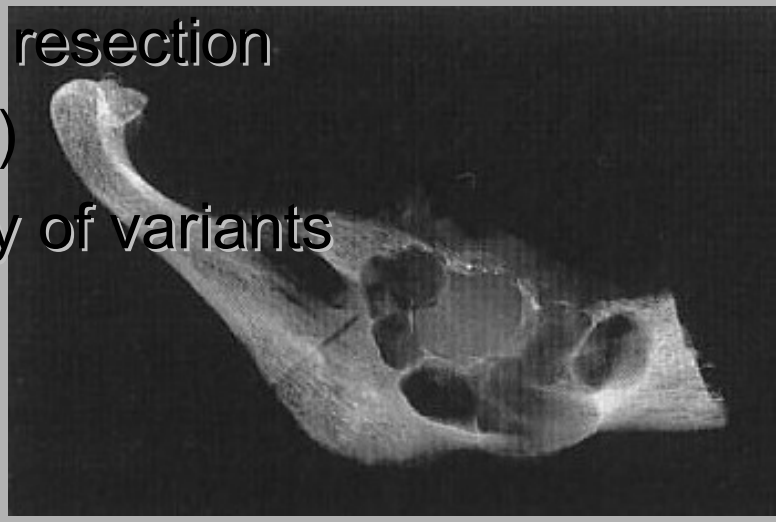
- 10-20 y, boys
- benign
- tumor with odontogennal epithelium and ectomesenchyma
- in molar mandible region
- dif.dg.
  - folicular cyst
  - ameloblastoma
- does not recidivate



Ameloblastic fibroma

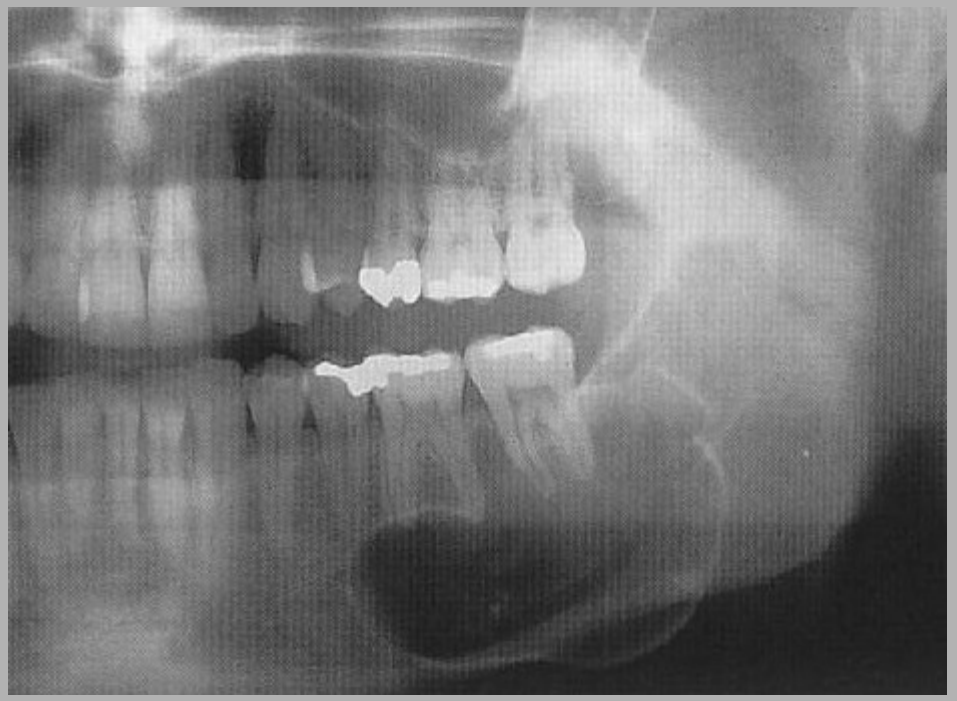
Ameloblastoma

- male/female 1:1
- benign; long-term relaps = radical resection
- in a region of caudal molars (80%)
- variable histological image – many of variants
- RTG
  - multilocular
  - multicystic
  - bubble transparency with septum around
  - compacta thin out
- slow growth, painless
- oedema, facial asymetry

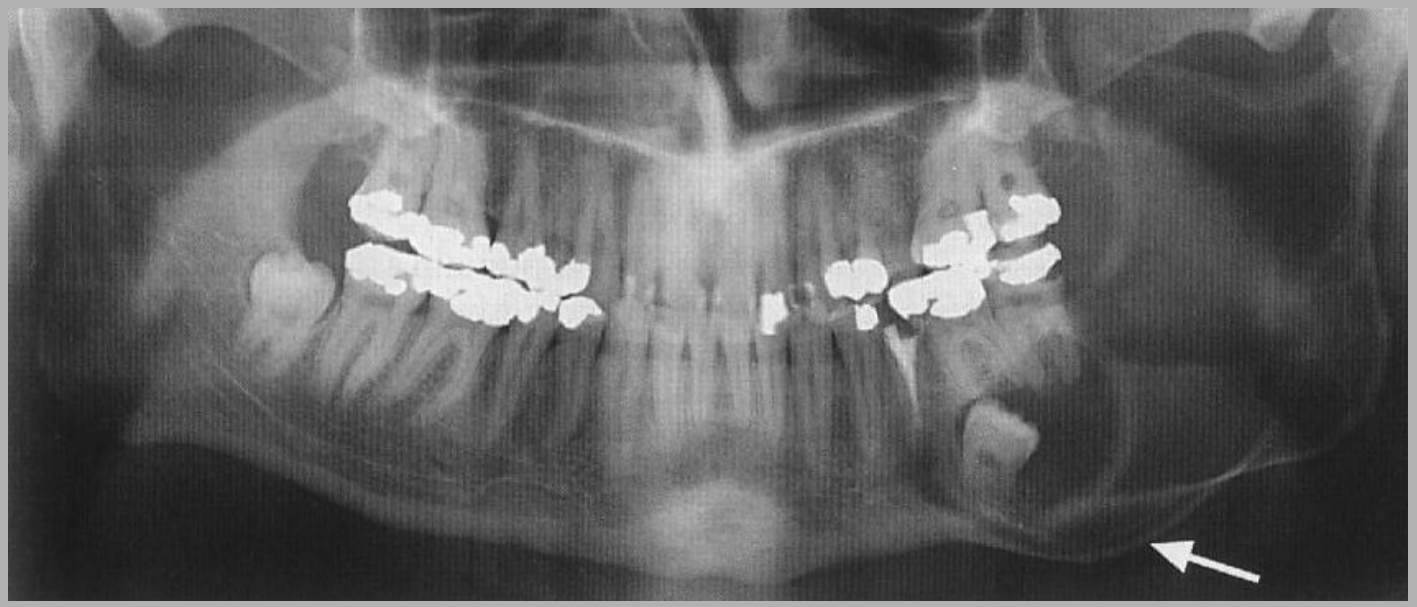


„honeycomb“ structure

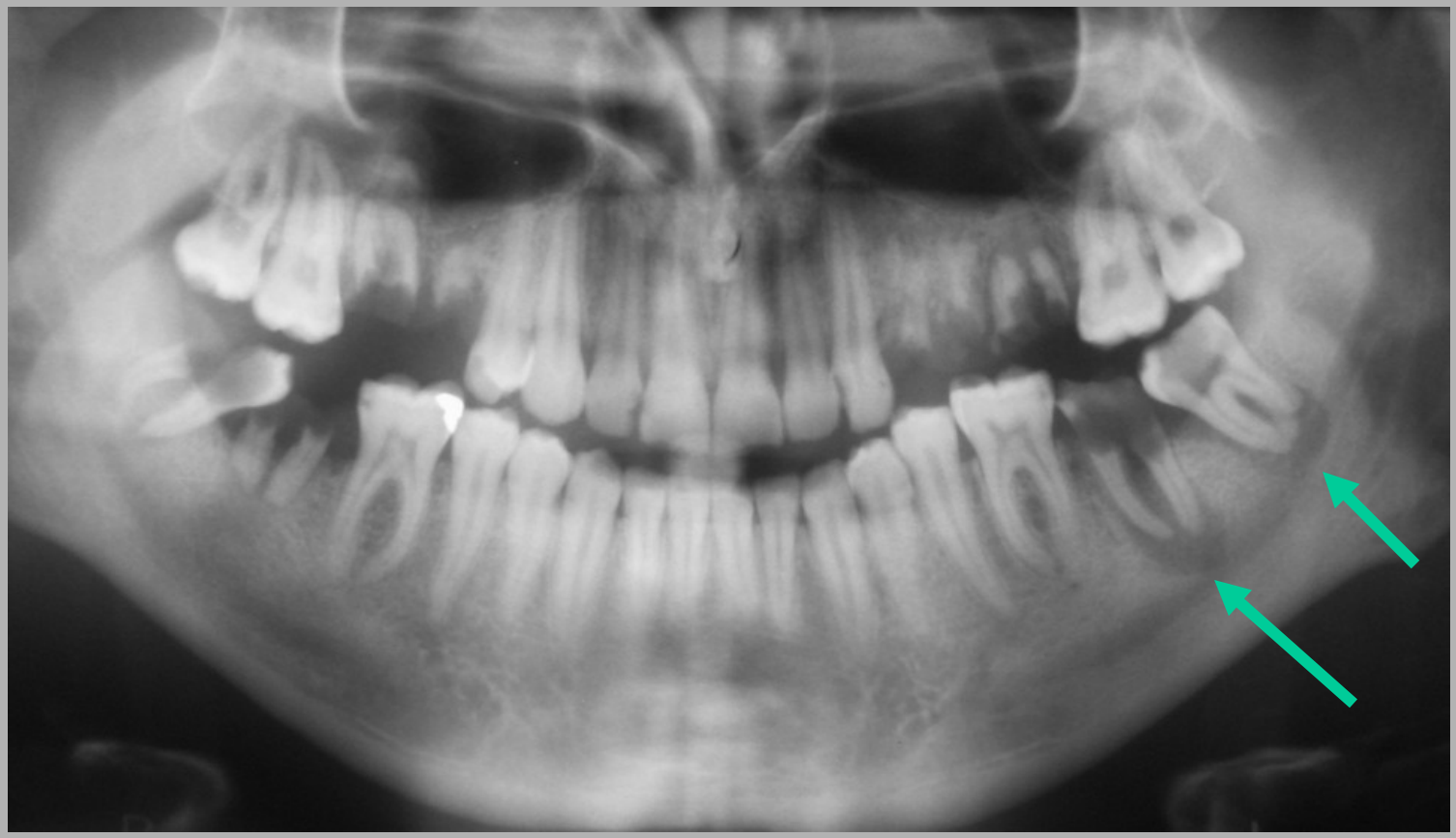
Ameloblastoma



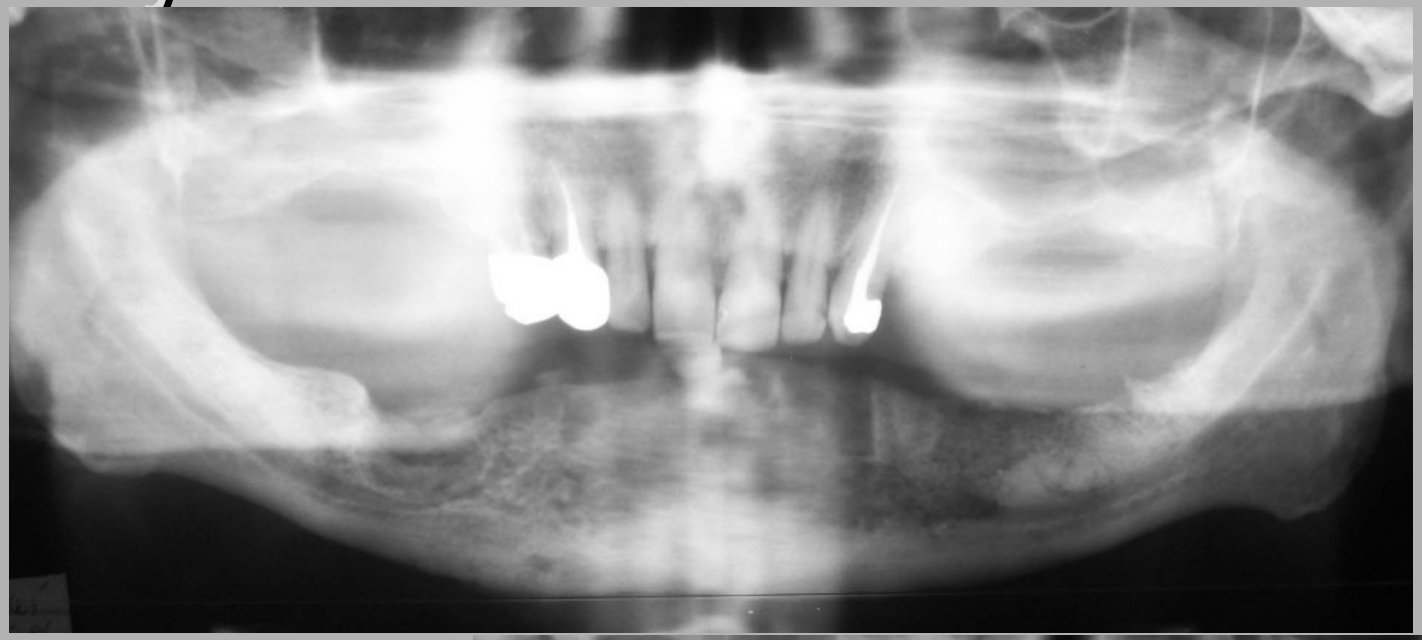
- dif.dg.
  - folicular cysts
  - keratocysts
  - ameloblastic fibroma
  - odontogennal myxoma
  - central eosinofil granuloma

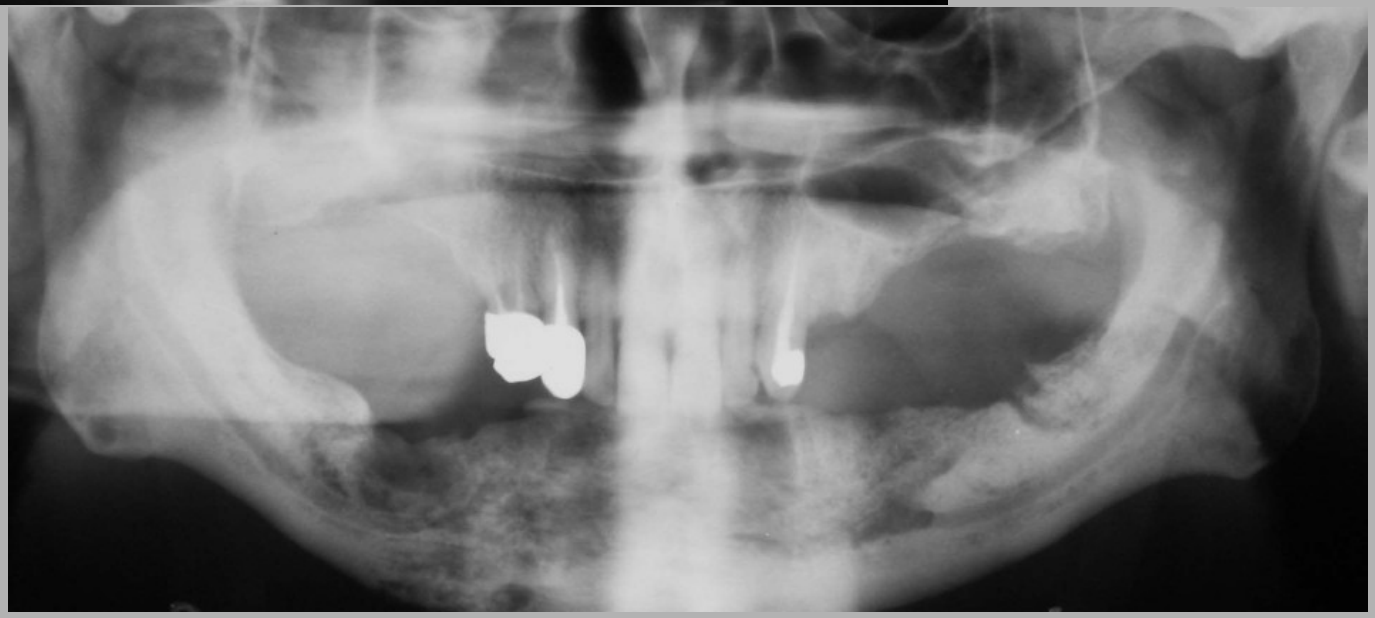


Periapical abscess



Myeloma





Literature

- Pasler F.A., Visser H.: Stomatologická radiologie. Kapesní atlas. 2007. ISBN 978-80-247-1307-6.
- http://rtg.misto.cz/_MAIL_/index.html