Carestream DENTAL

Everything you wanted to know about Panoramic Images….

What we can find inside
How to read/decrypt them

SA@MLV

Agenda

- Why a panoramic ?
- Main clinical indications
- Main limitations
- Geometry (positioning)
- Four regions of diagnosis
  - Main anatomical landmarks
- Read a panoramic
- Common errors of positioning
- Clinical review
- Artifacts in the image
  - Ghost images
- Addendum

Why a panoramic exam ?

- Often prescribed as an « exploration » **first intention procedure.**
- A monitoring tool (suivi)
- A screening tool (dépistage)
- Excellent **communication mean** with patient
    - easily understood

Because
That image allows a **global evaluation** of dento-maxilary structures and their environment.

The panoramic image meets:

- **Anatomical logic** in its dimensions by placing the dental system in its natural environment (bone structures, air cavities, soft tissues....)
- **Anatomical logic** allowing a bilateral, always desirable comparison
- **Diagnostic logic**, giving advantage to "global" without obscuring the "special"
- **Economic logic** : low cost, information richness
- **Patient safety logic** : low x-ray dose

Main clinical indications

- → Assessment of **growth and development** of children and adolescent to view the mixed dentition or evaluate third molars.
- → **Dental anomalies** (number and shapes)
- → Dental **pathologies** (caries and complications)
- → **Impacted teeth** and complications
- → **Periodontal diseases** (horizontal, vertical bone loss…)
- → **Dental trauma** and associated bone lesions
- → **Sinus** disorders (pneumatisation, sinusitis, foreign body..)
- → Evaluation of possible **mandibular fractures** following trauma to the jaws
- → **Craniofacial** anomalies
- → Evaluation of **temporomandibular joint** (TMJ) disorders.

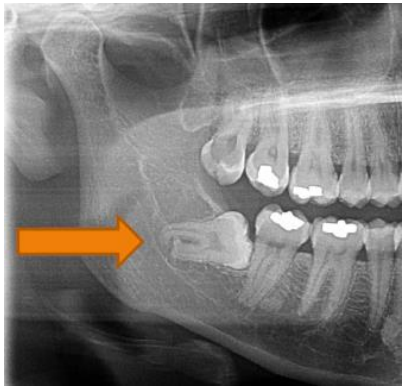
Main limitations

- Image of superposition : superposed structures (in or outside the focal trough) can **simulate pathologies**

Glossopharyngal airways superposed to the ramus
Imitates a bone lesion

- Different enlargement in the image according to the anatomical localization : **no possible precise measurements**

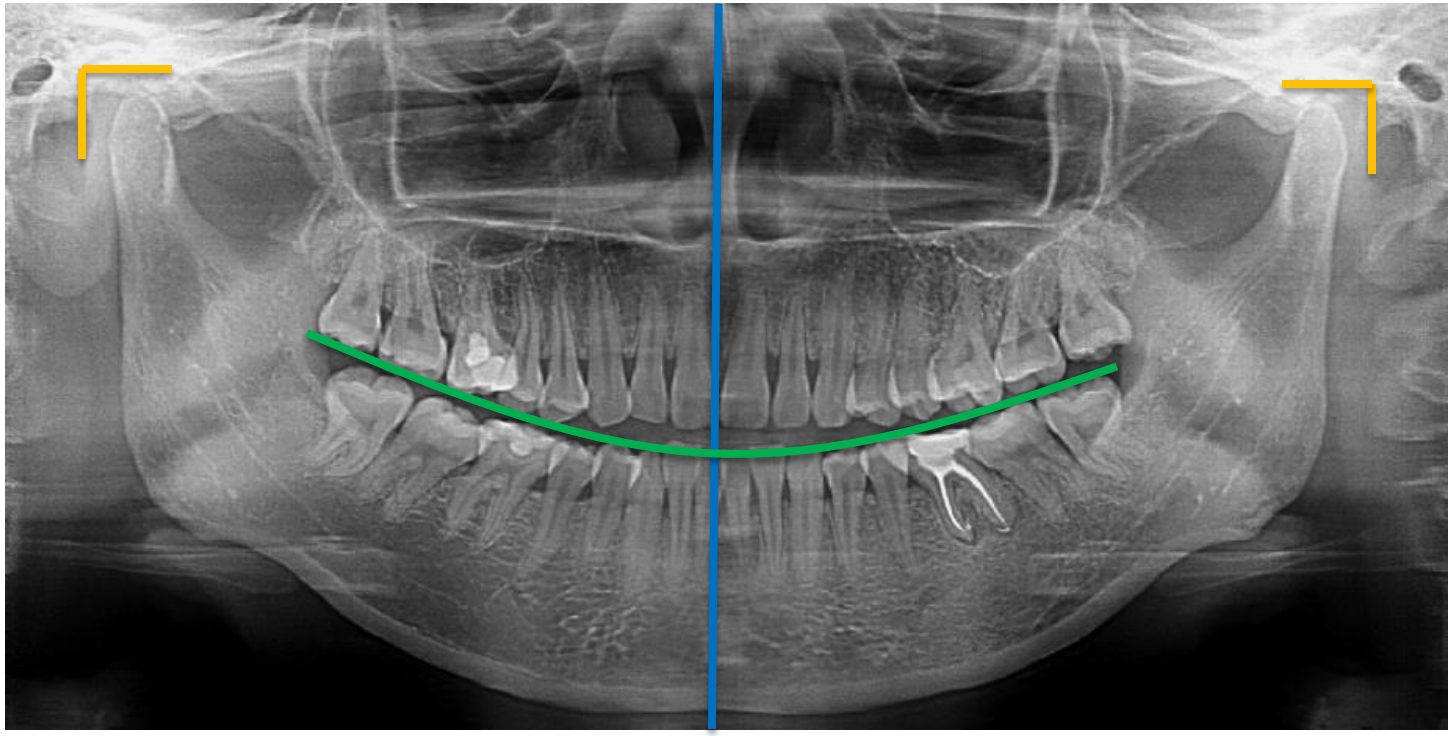
- **No vestibulo-lingual depth information**
  - Impacted tooth : vestibular ? Lingual ?
  - Position of wisdom teeth roots versus mandibular canal ?
  - A vestibulo-lingual angled tooth appears shorter



Geometry : correct image

1. Right-Left symetry: sagital plane splits the anterior teeth
2. TMJ height and vacant space of right and left are equal
3. Occlusal plane is slightly smiling

   → Importance of the **FRANKFURT PLANE being horizontal**



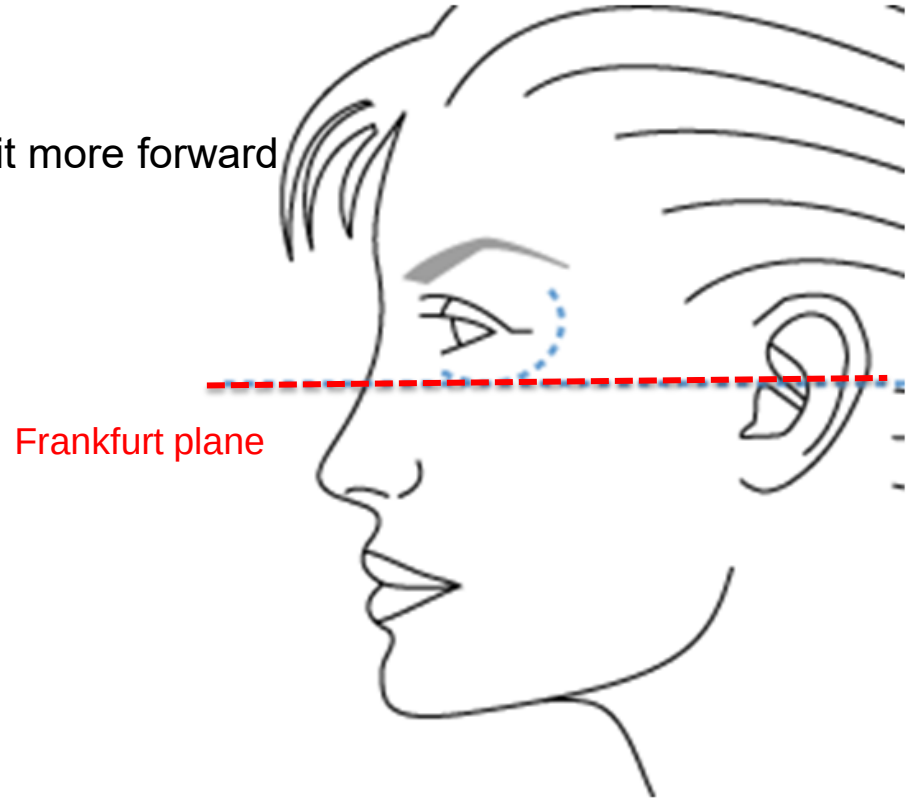
Refer to indications for positioning the patient correctly in the systems user guides

Frankfurt plane

A line used in anthropometry, which passes from the highest point of the ear canal through to the lowest point of the eye socket.

Ideal patient positionning for a panoramic procedure means having that plane horizontal

It means having patient's head a bit more forward than the usual head position.

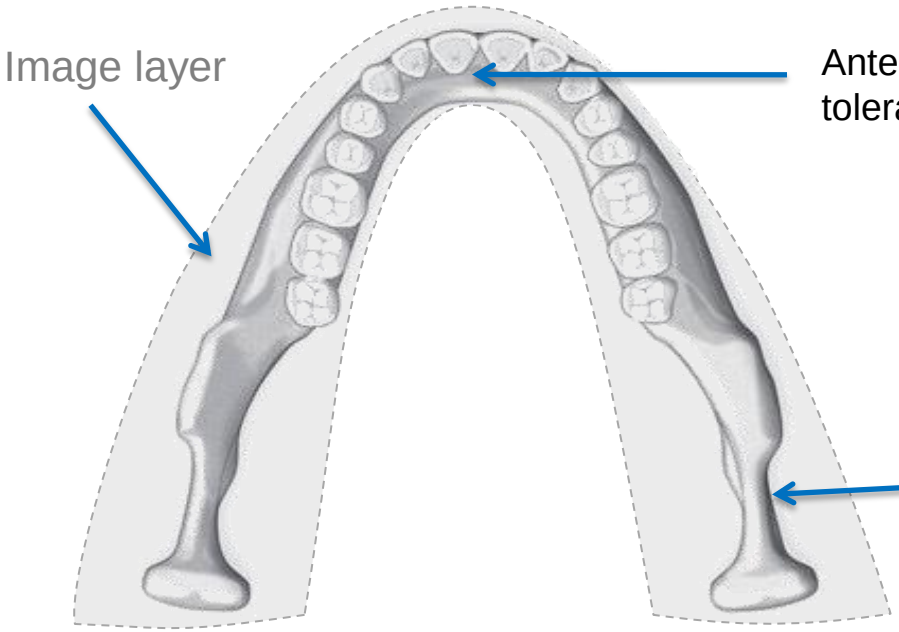


http://conseildentaire.com/wp-content/uploads/2012/06/Plan-de-Franckfort1.png

Why an horizontal Frankfurt plane ? 1/2

Panoramic is part of « image layer radiography » ; patient's dental arch must be positioned within a narrow zone of sharp focus : « image layer » or « focal trough »

- Objects within the image layer appear sharp
- Objects in front or behind (outside) the image layer are blurred



Anterior area : **narrow zone of sharpness**, small tolerance (around 0,5cm)

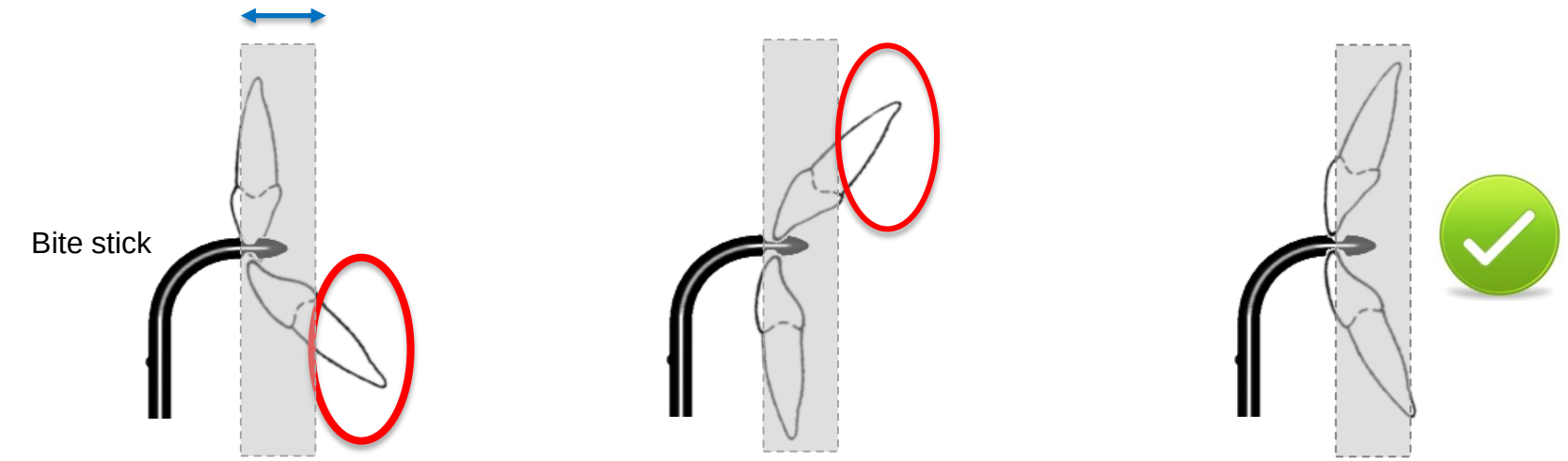
User must be sure to get anterior dentition (and specialy teeth apex) inside that focal trough

Posterior area : **larger zone of sharpness**. Wider tolerance (around 2cm)

Why an horizontal Frankfurt plane ? 2/2

That's the best position to get anterior root apex within the focal trough, thus sharp.

Below, an illustration of a sagital view of a patient biting stick :



Patient tilted too forward

Lower root apex zone out of focus
Will appear blurred in the image

Patient tilted too backward

Upper root apex zone out of focus

Francfurt plane alignment

Both apex within focus plane

Four regions of diagnosis

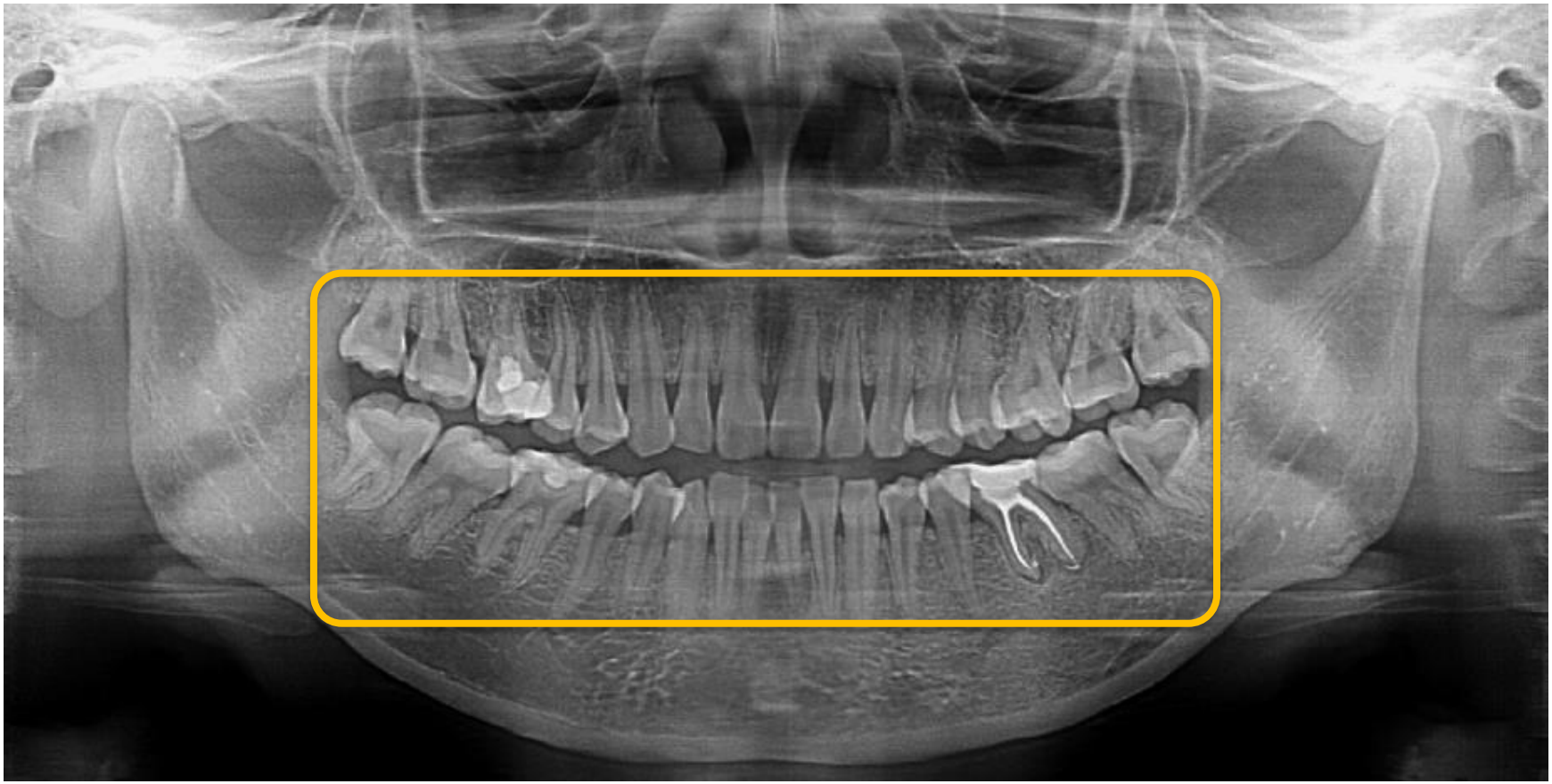
1 - Maxilar

Nasal structures : bones, turbinates (fossa)
Maxilar bones and sinus

Four regions of diagnosis

2 - Teeth and alveolar bone

Teeth, apex
Periodontal bone



Four regions of diagnosis

3 - Mandibula

Mandibular bone, rim
Mandibular canals
Foramens

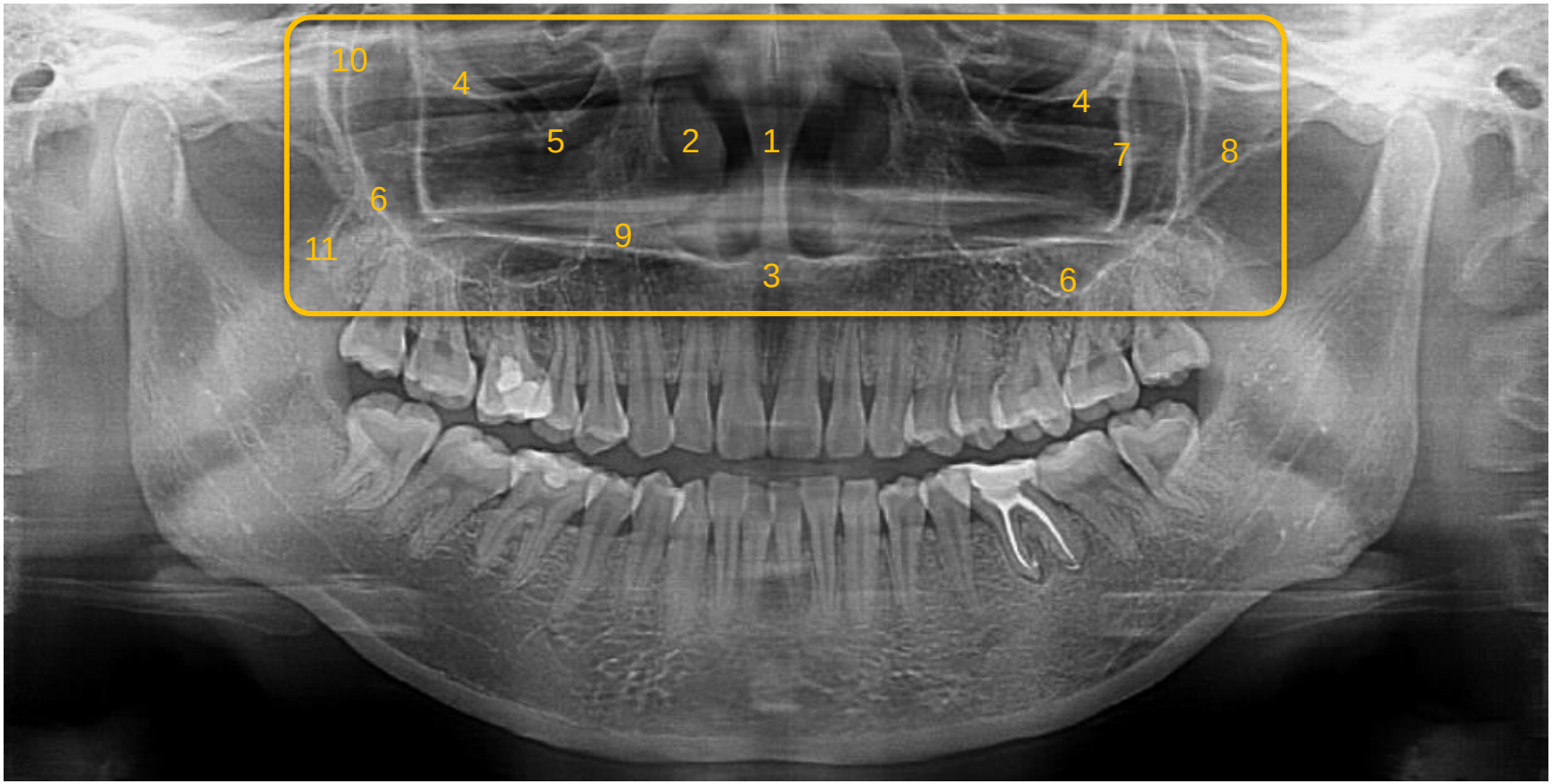
Four regions of diagnosis

4 - Temporo-mandibular Joint, including retromaxilar and cervical spine areas

Main anatomical landmarks

1 - Maxilar

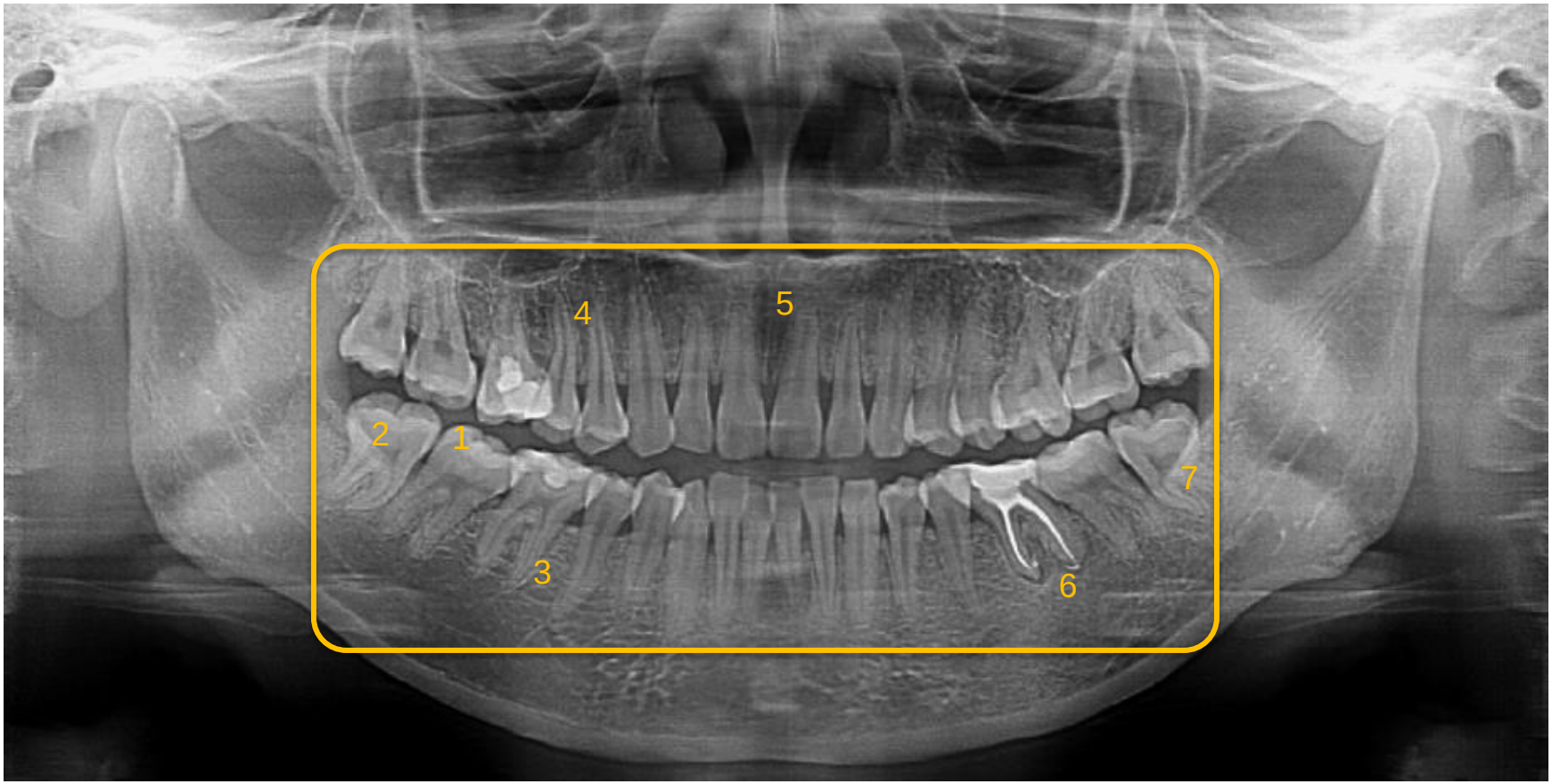
1-nasal septum, 2-nasal fossa (turbinates), 3-nasal spine, 4-orbital floor, 5-infraborbital canal, 6-wall of maxillary sinus, 7-zygomatic process, 8-zygomatic arch, 9-hard palate,10-pterygomaxillary fissure, 11-maxillary tuberosity



Main anatomical landmarks

2 - Teeth and alveolar bone

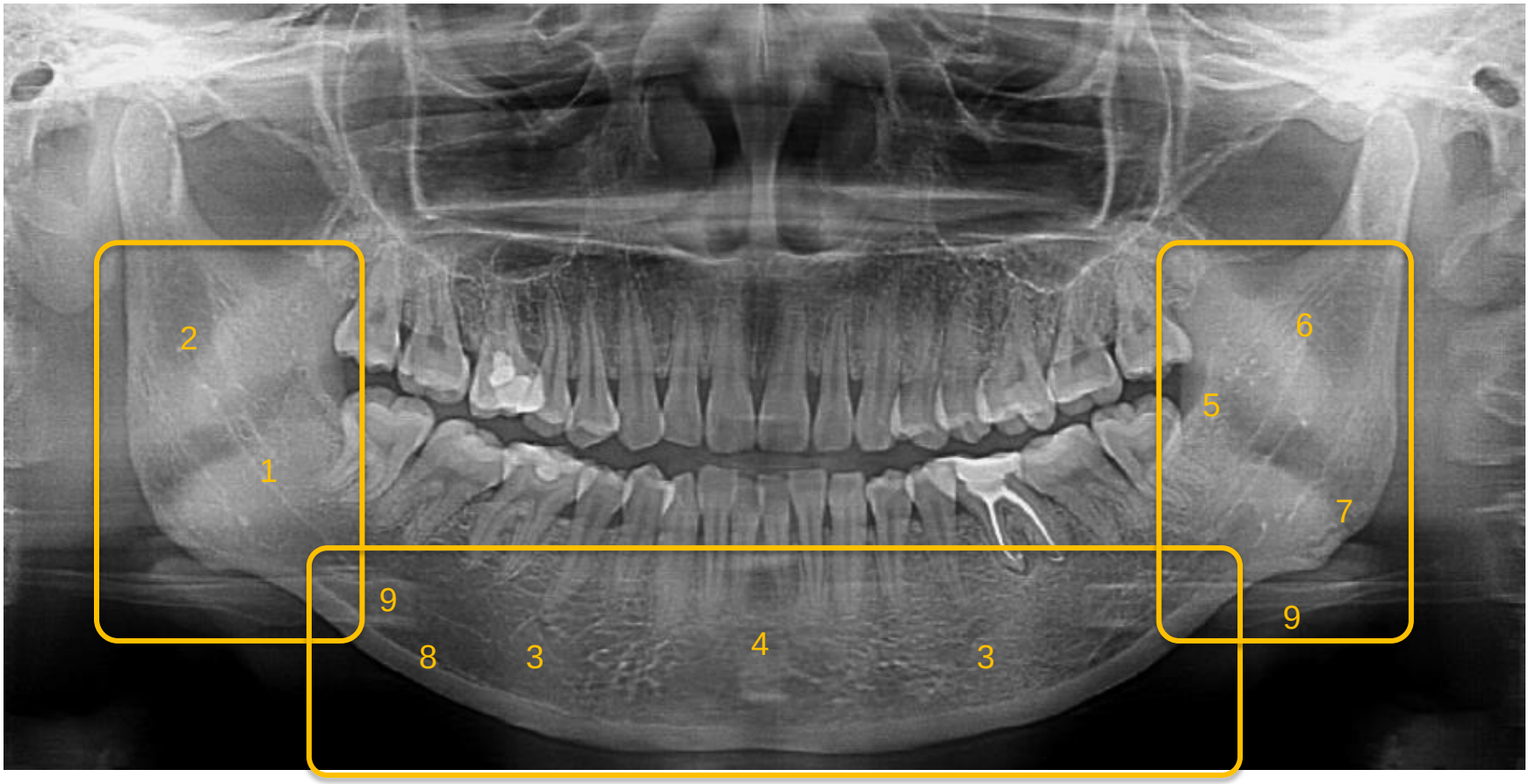
1-crown, 2-pulp chamber and root canal,
3-periodontal ligament space, 4-lamina dura, 5-incisive foramen,
6-root apex, 7-internal oblique ridge



Main anatomical landmarks

3 - Mandibula

1-mandibular nerve canal, 2-mandibular foramen, 3-mental foramen
4-genial tubercle, 5-external oblique ridge, 6-ramus, 7-angle of the mandible,
8-inferior border of the mandible, 9-hyoid bone



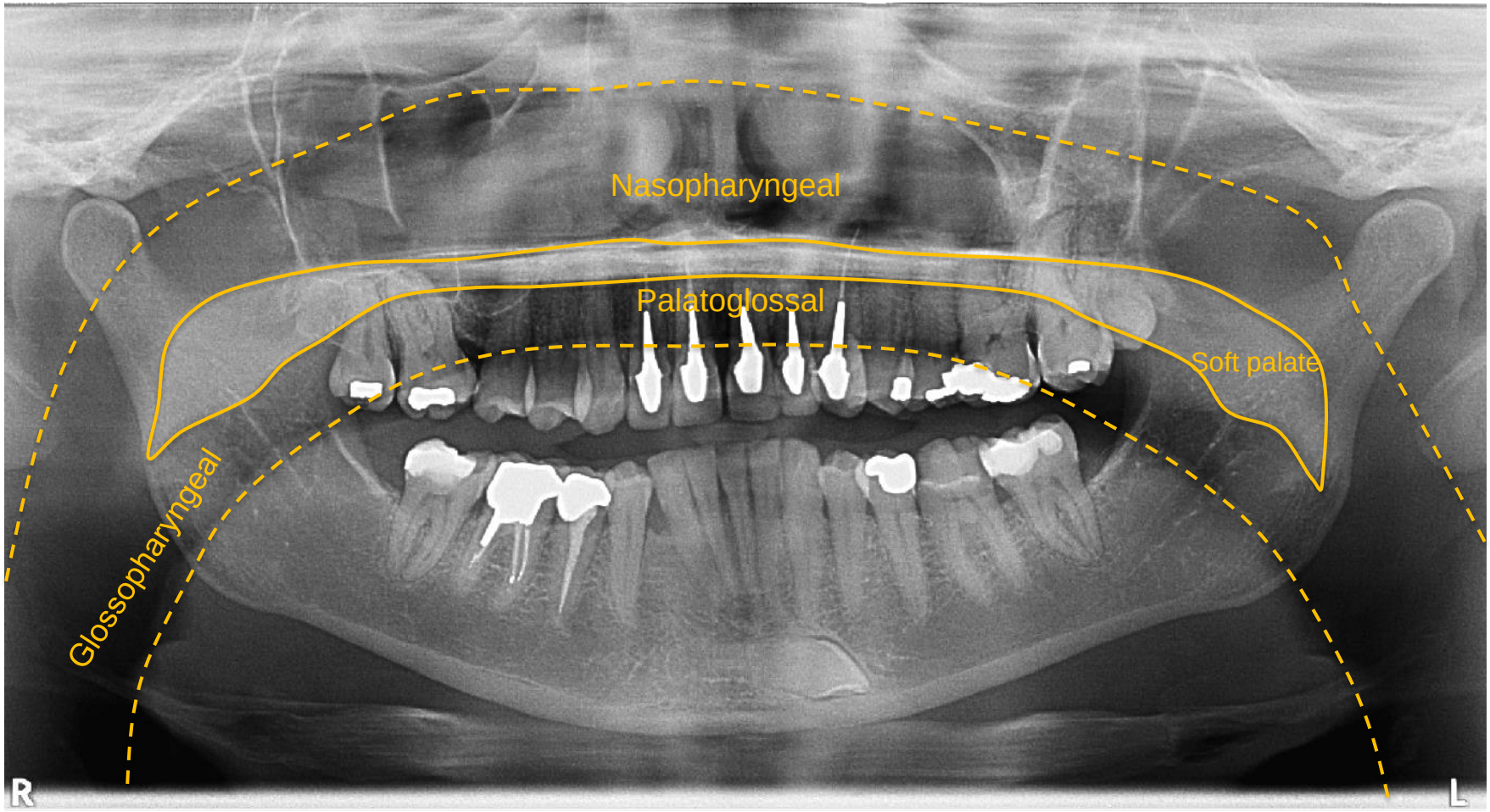
Main anatomical landmarks

4 - TMJ

1- condyle, 2-glenoid fossa, 3-articular eminence, 4-external auditory meatus, 5-cervical spine
6-hyoid process, 7-ear lobe, 8-mastoid process

Main anatomical landmarks

Air spaces



Read a panoramic

1. Assess vertical and horizontal symetry
2. Count the teeth
3. Analyze teeth and anatomic structures from center to outside
4. Examine soft tissues
5. Examine anatomic structures on the edge of the image

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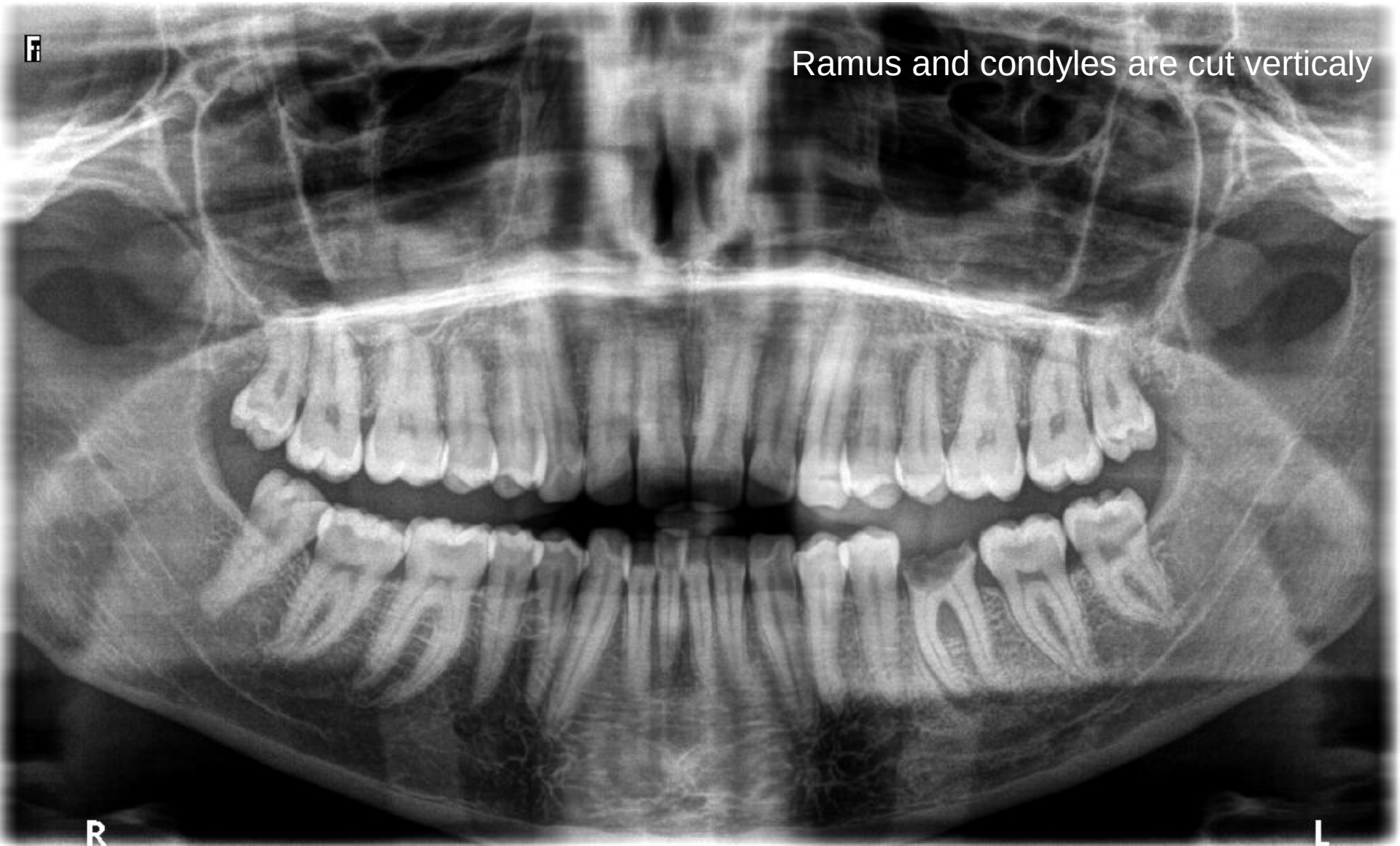
Common errors of positioning

Reminder : a good panoramic

Patient size (selected) too small

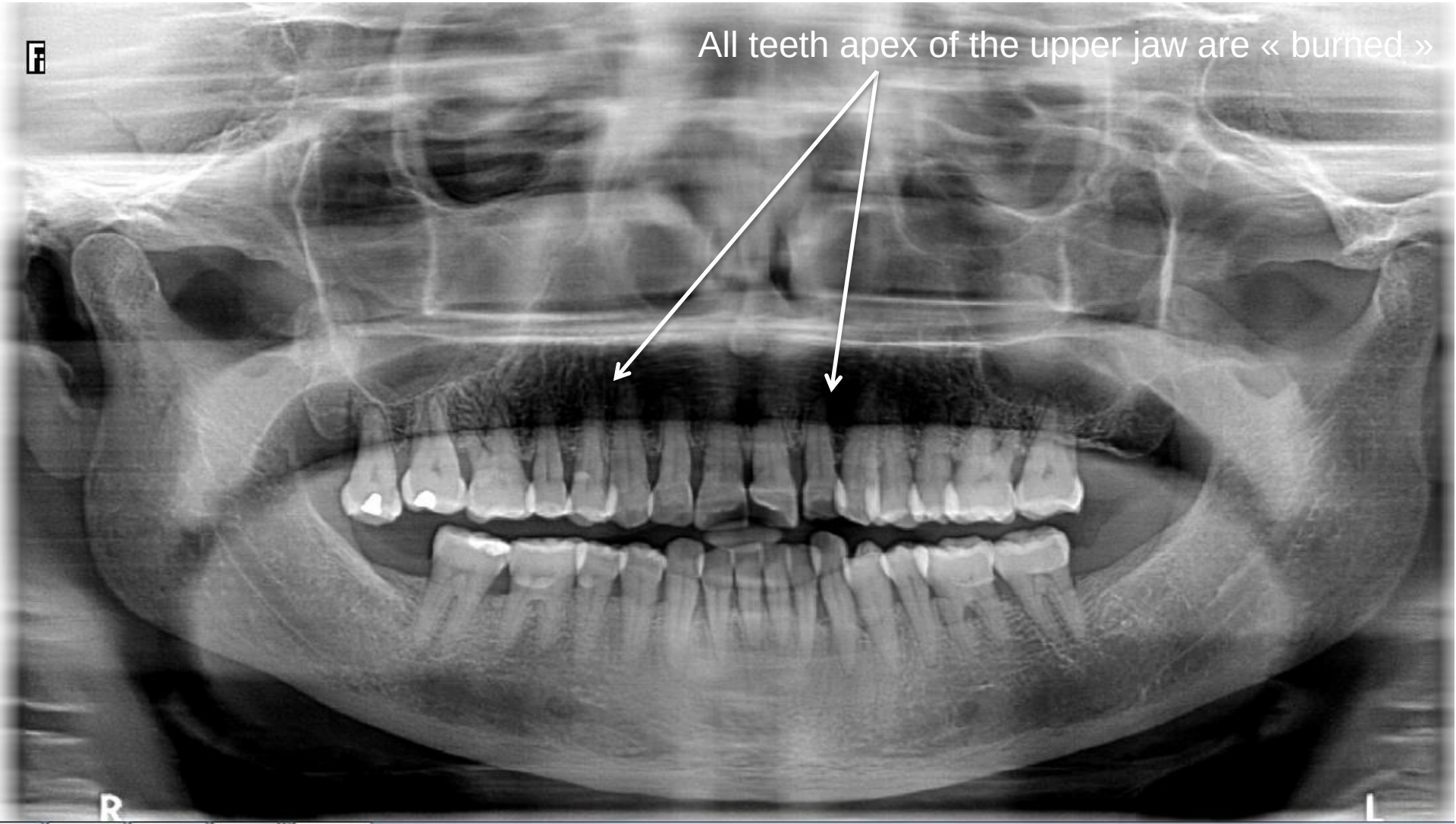


Patient size (selected) too large +….

Much too spine appears in the image

(+ earrings + patient too forward)

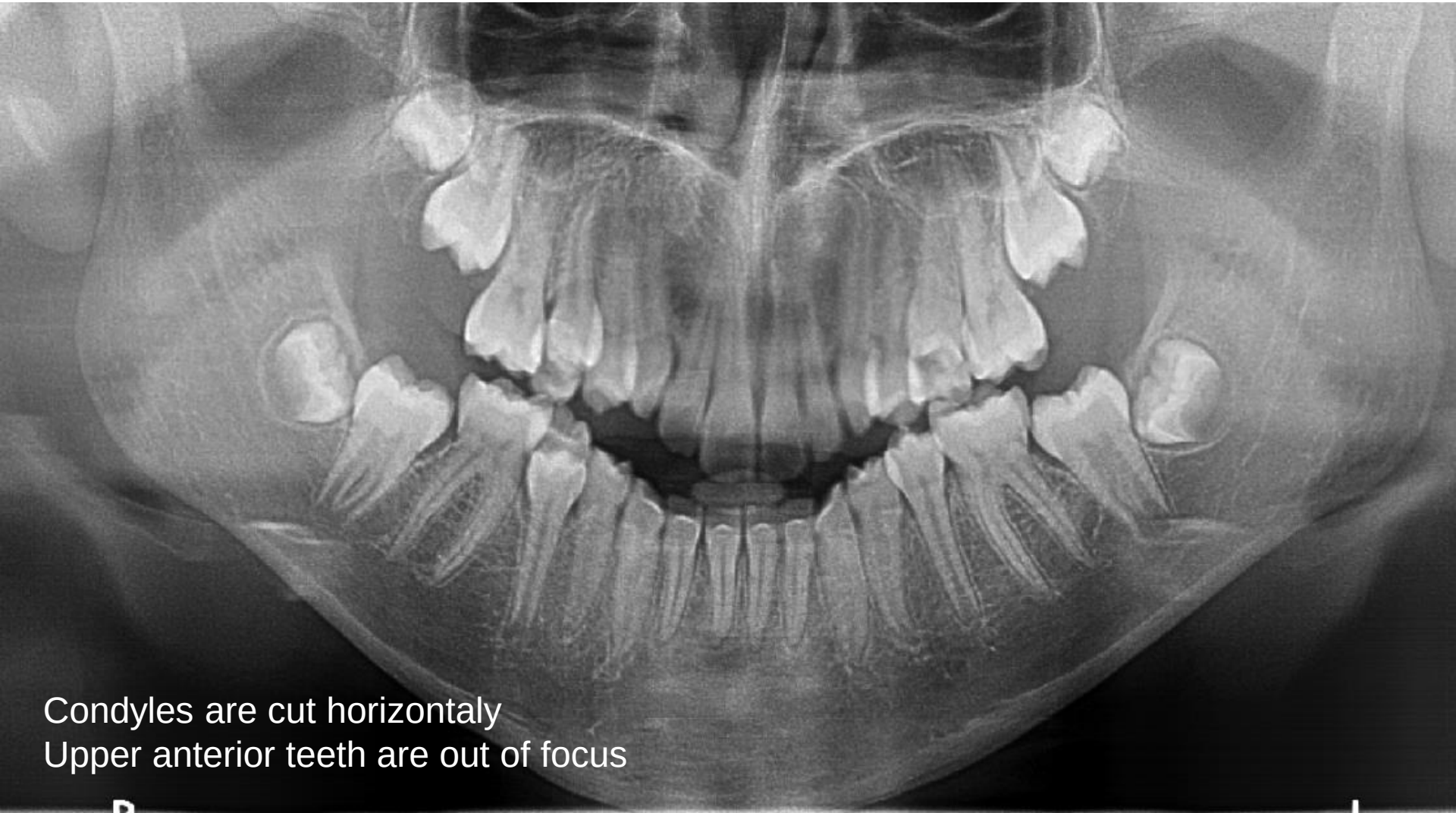
Tongue not stuck to palate



Patient twisted (and tilted)

Right ramus and teeth appear larger than on the left side (of the patient)

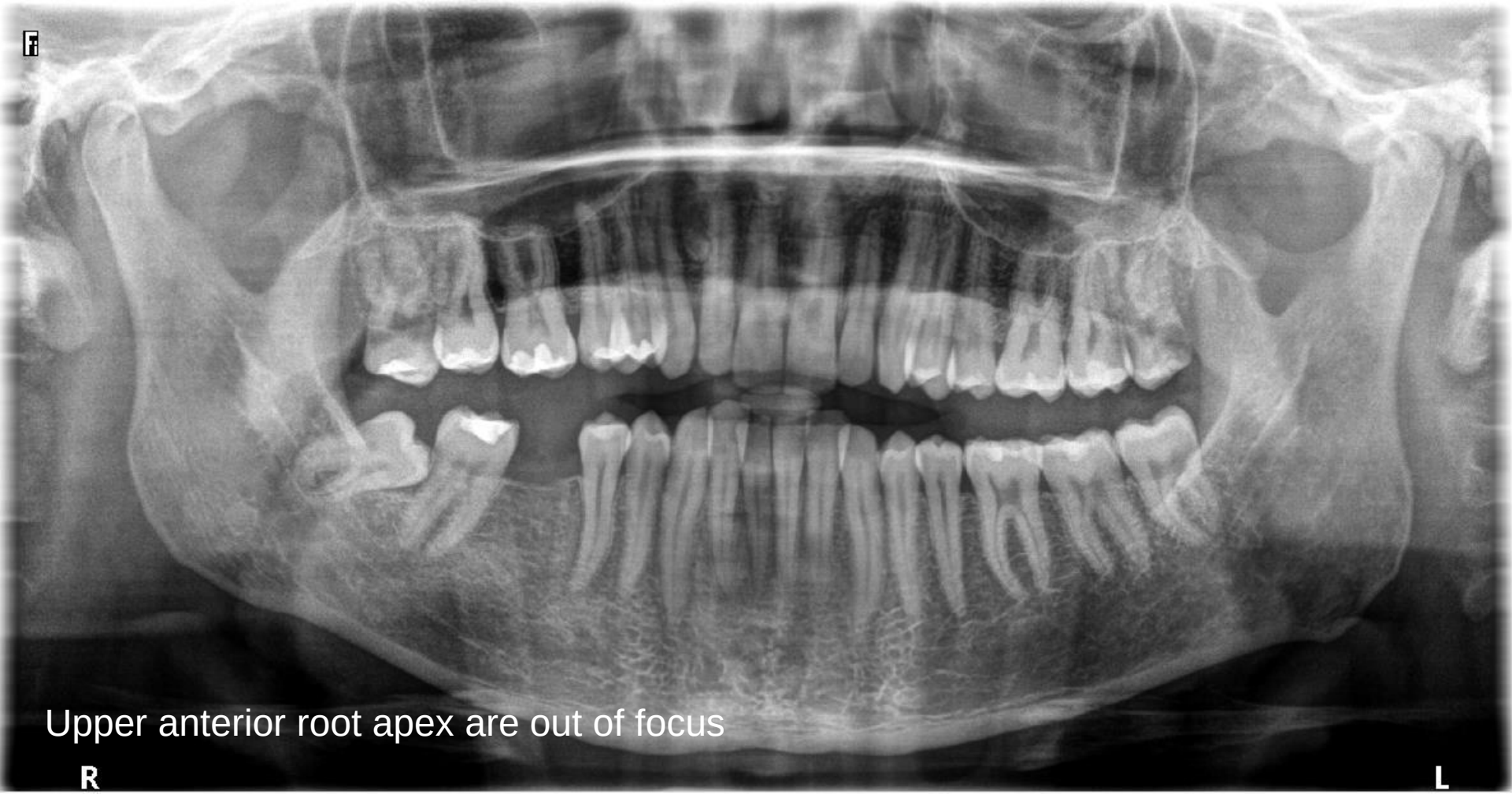
Patient’s head tilted too forward



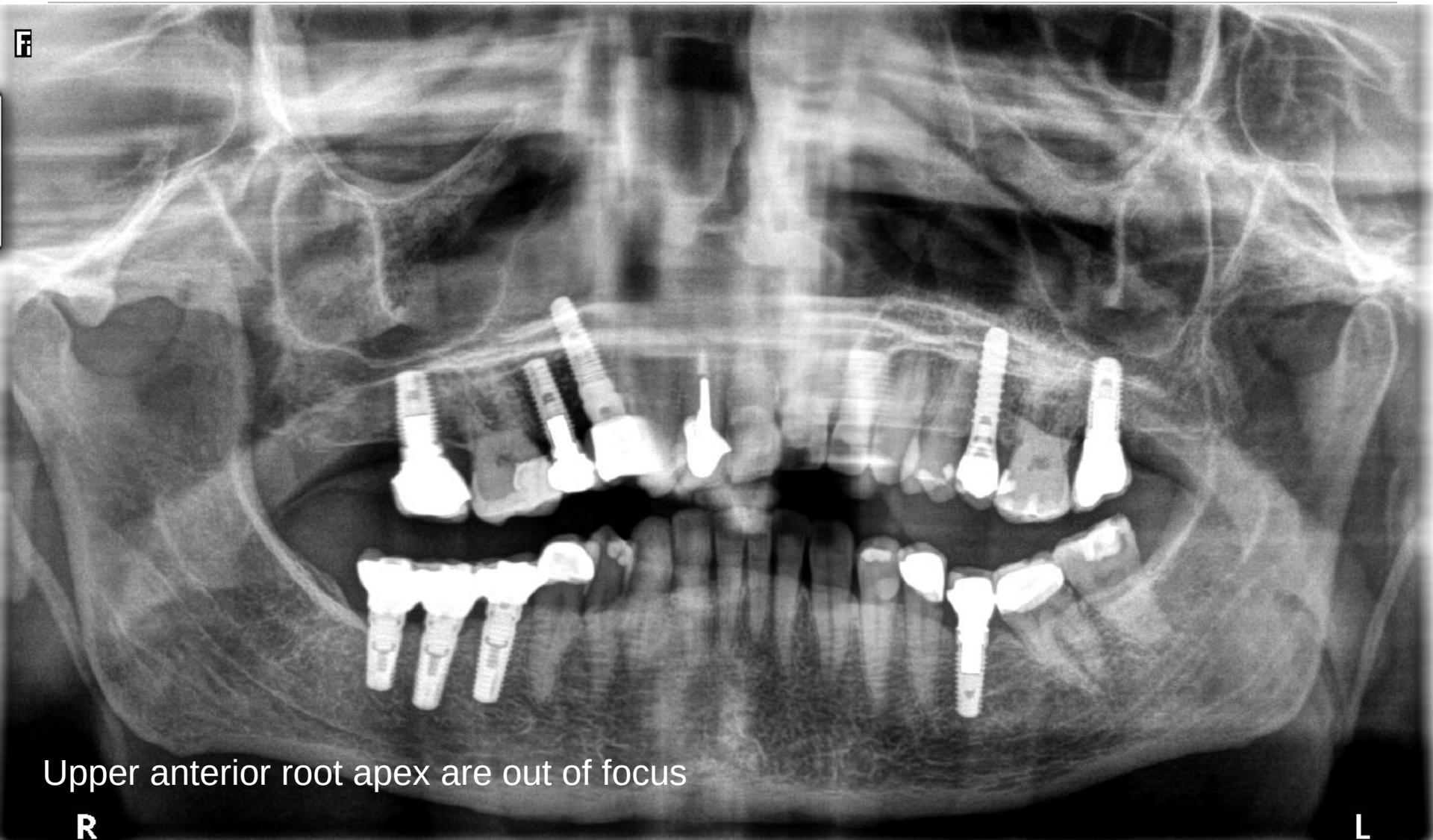
Condyles are cut horizontaly
Upper anterior teeth are out of focus

Patient’s head tilted too forward

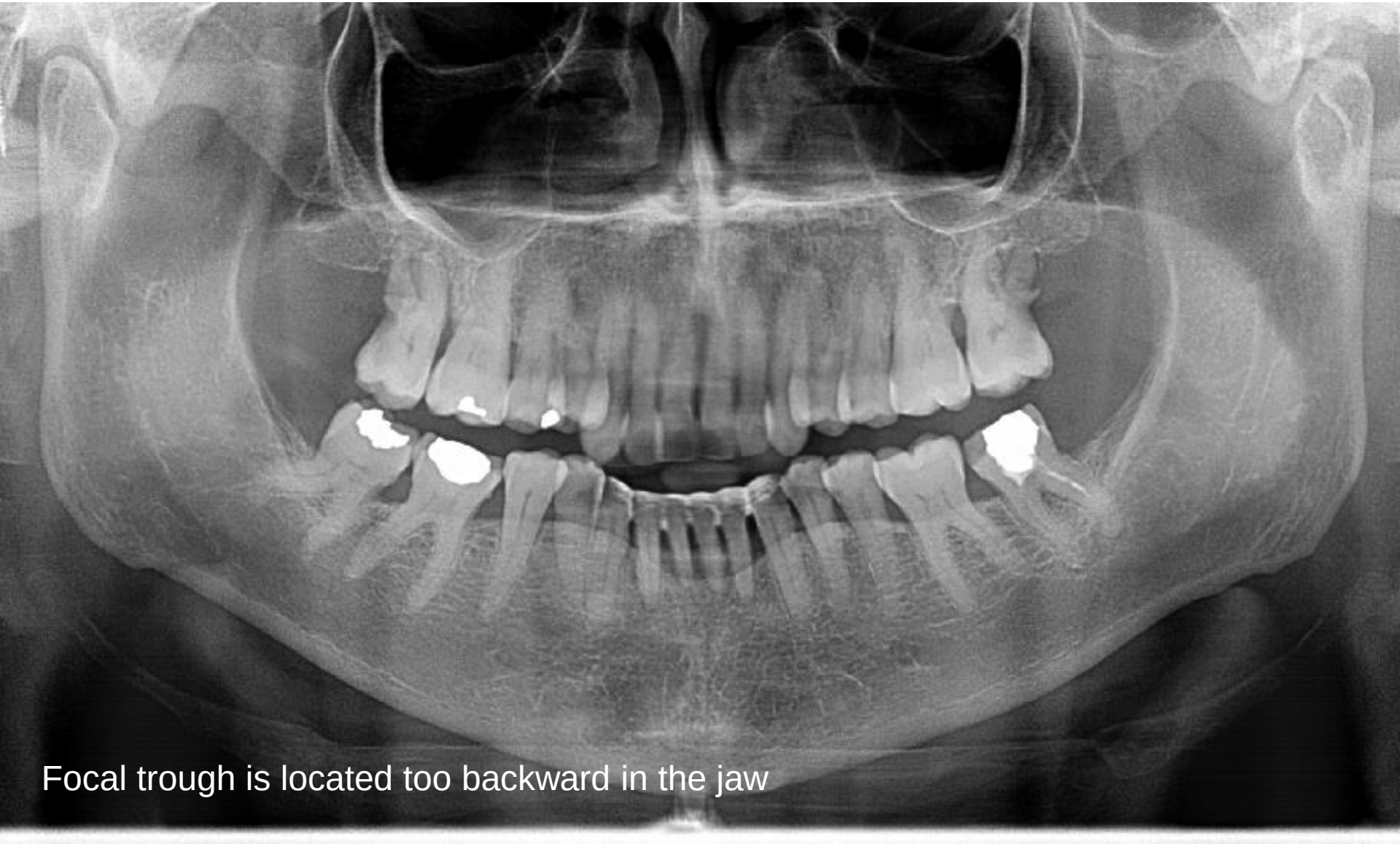
Patient’s head tilted too backward



Patient's head tilted much too backward, + twist



Anterior teeth too narrow



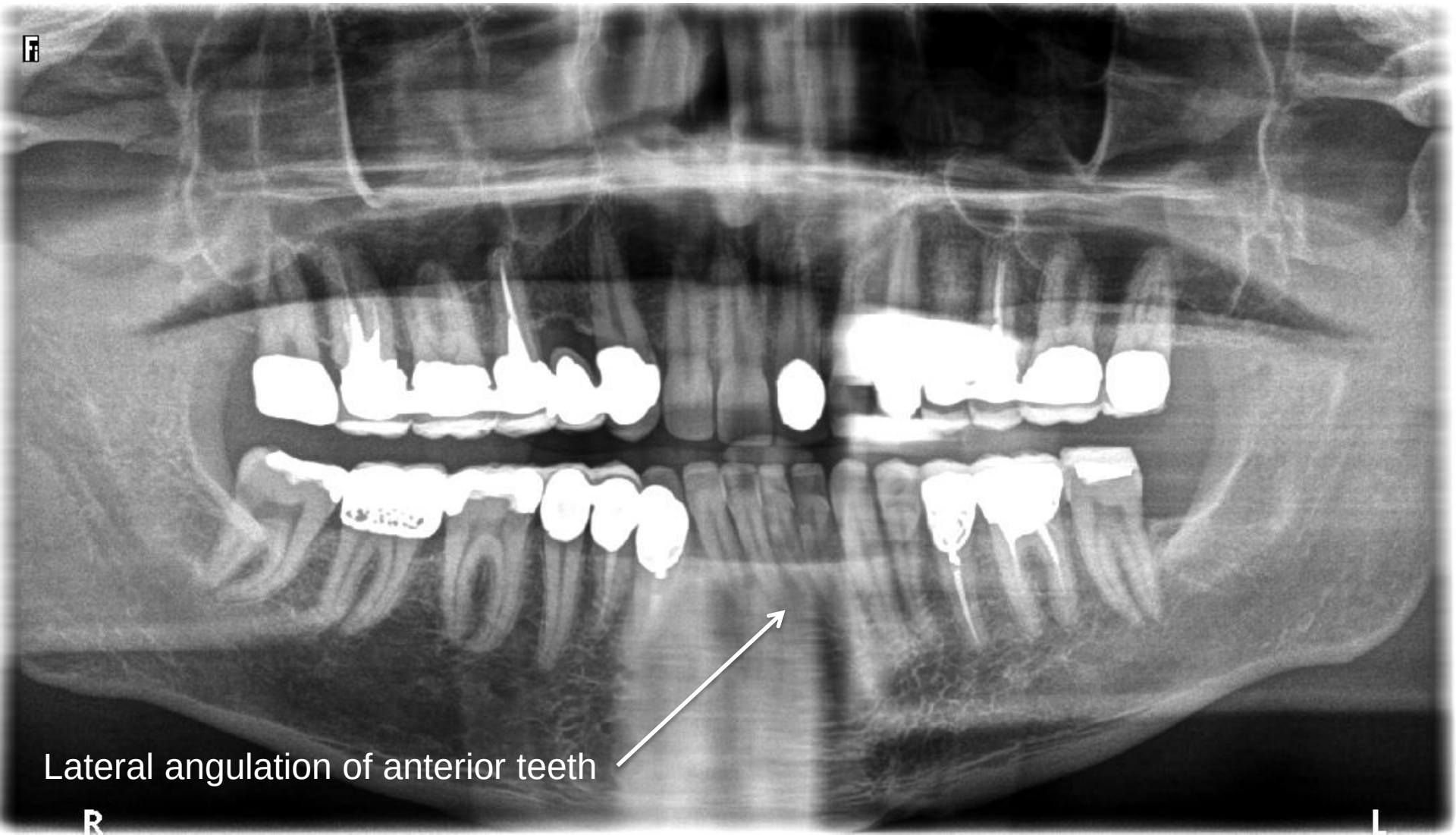
Focal trough is located too backward in the jaw

Anterior teeth too large

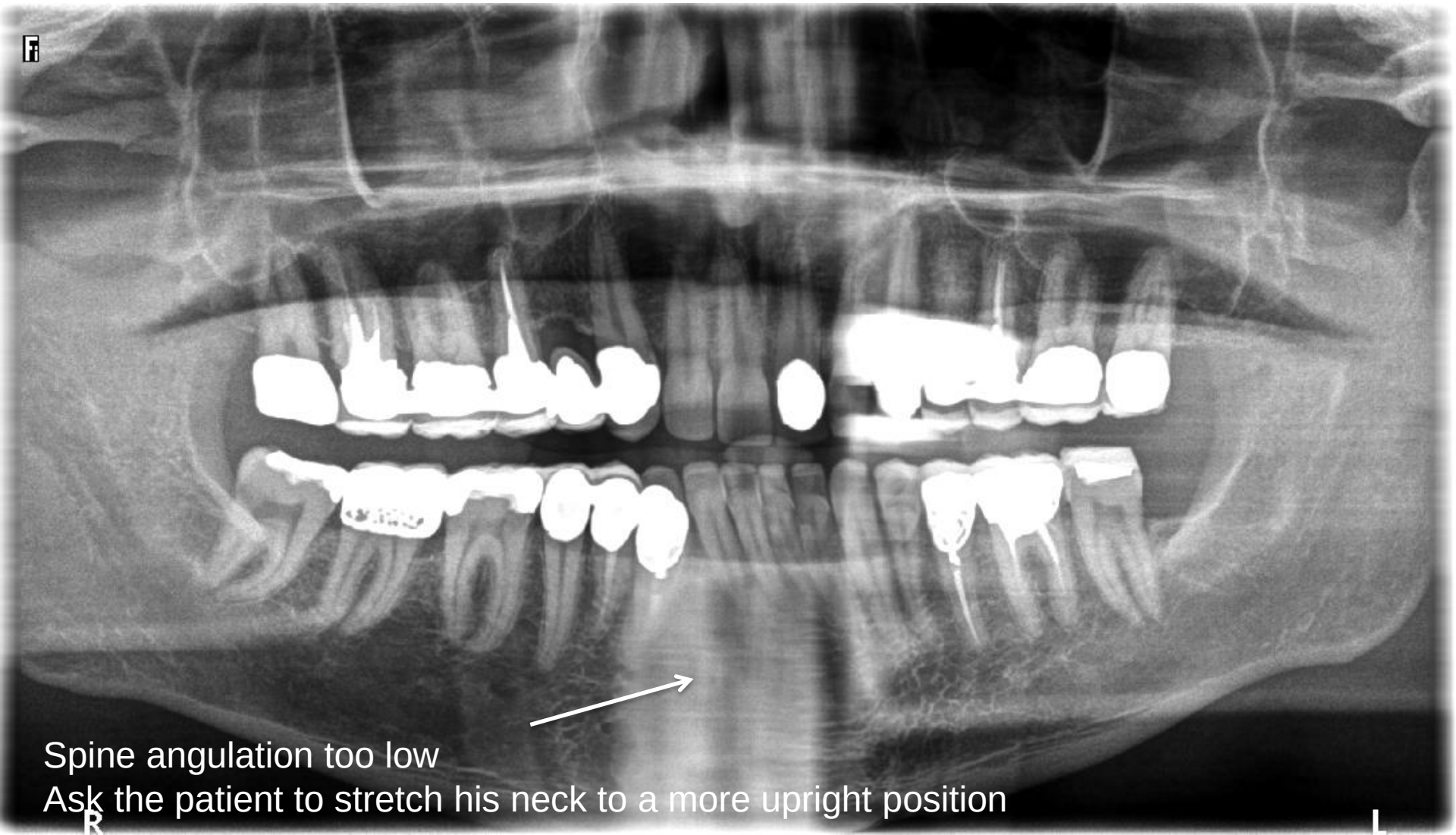
Focal trough is located too forward in the jaw

Patient not resting on the chin support + Earrings

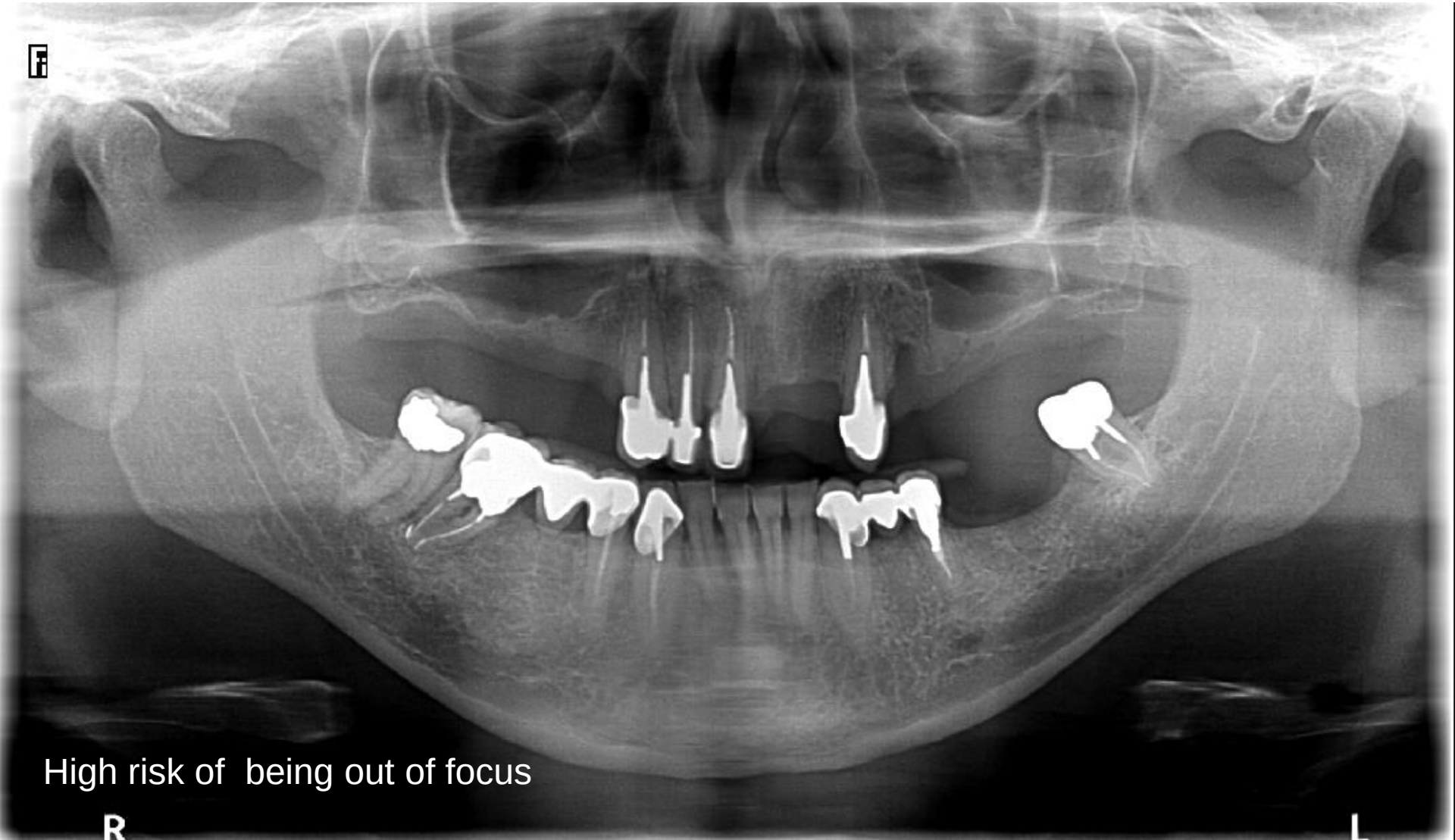
Patient motion



Vertical radio opaque strip in the mandibula



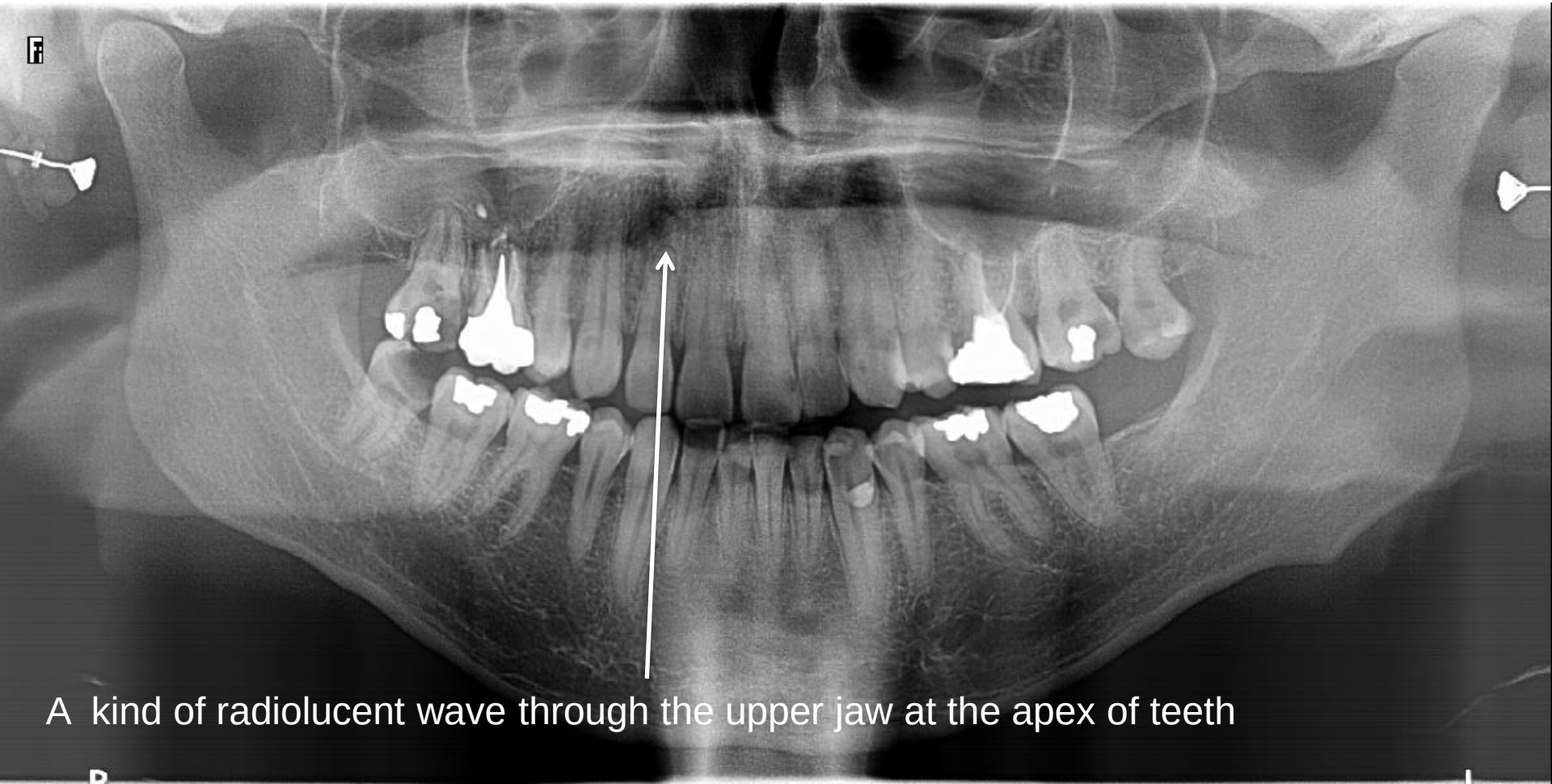
No bite stick



High risk of being out of focus

Patient swallowed during the scan

+ no bite stick



A kind of radiolucent wave through the upper jaw at the apex of teeth

Clinical review

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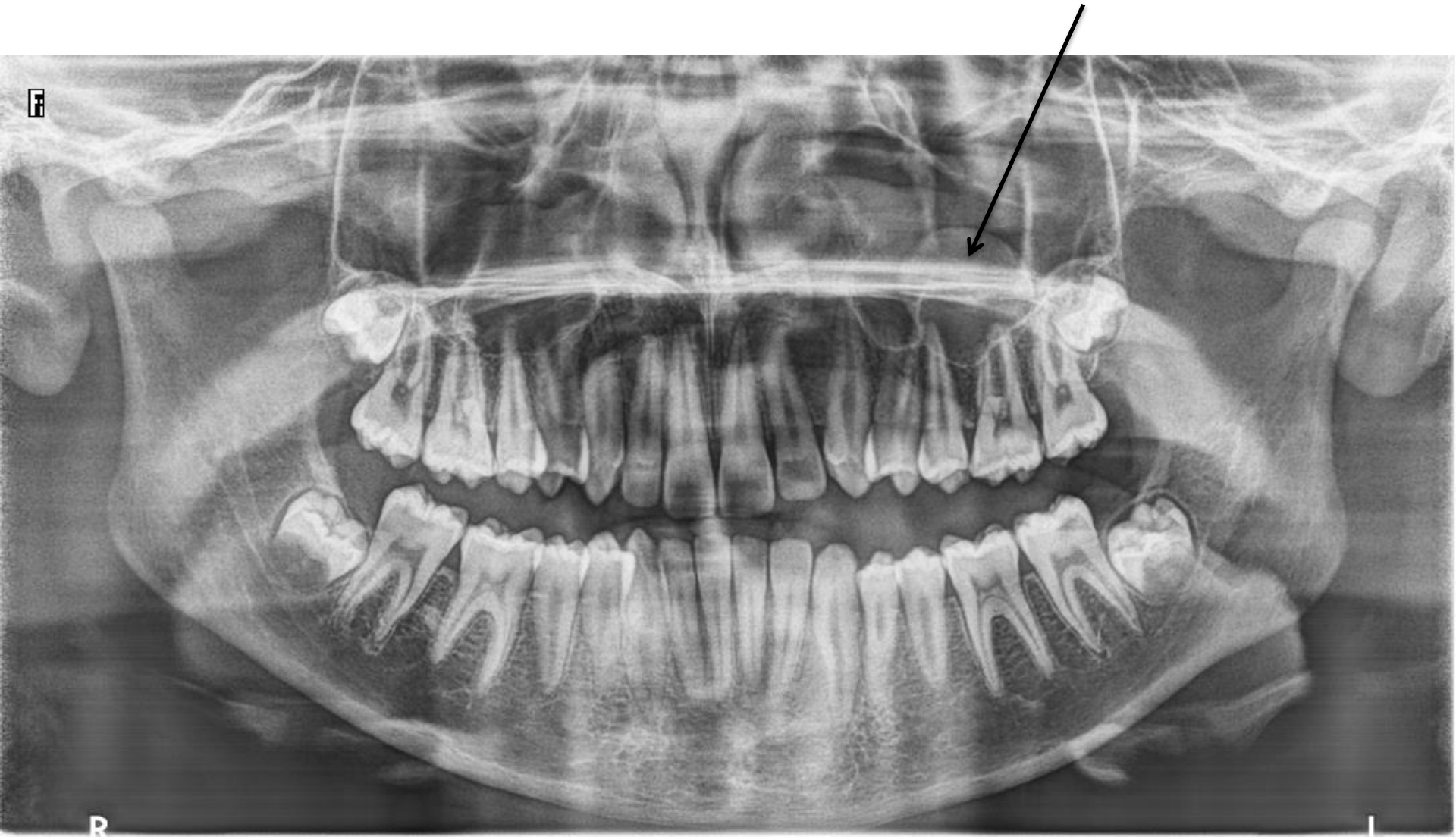
Polyp inside sinus

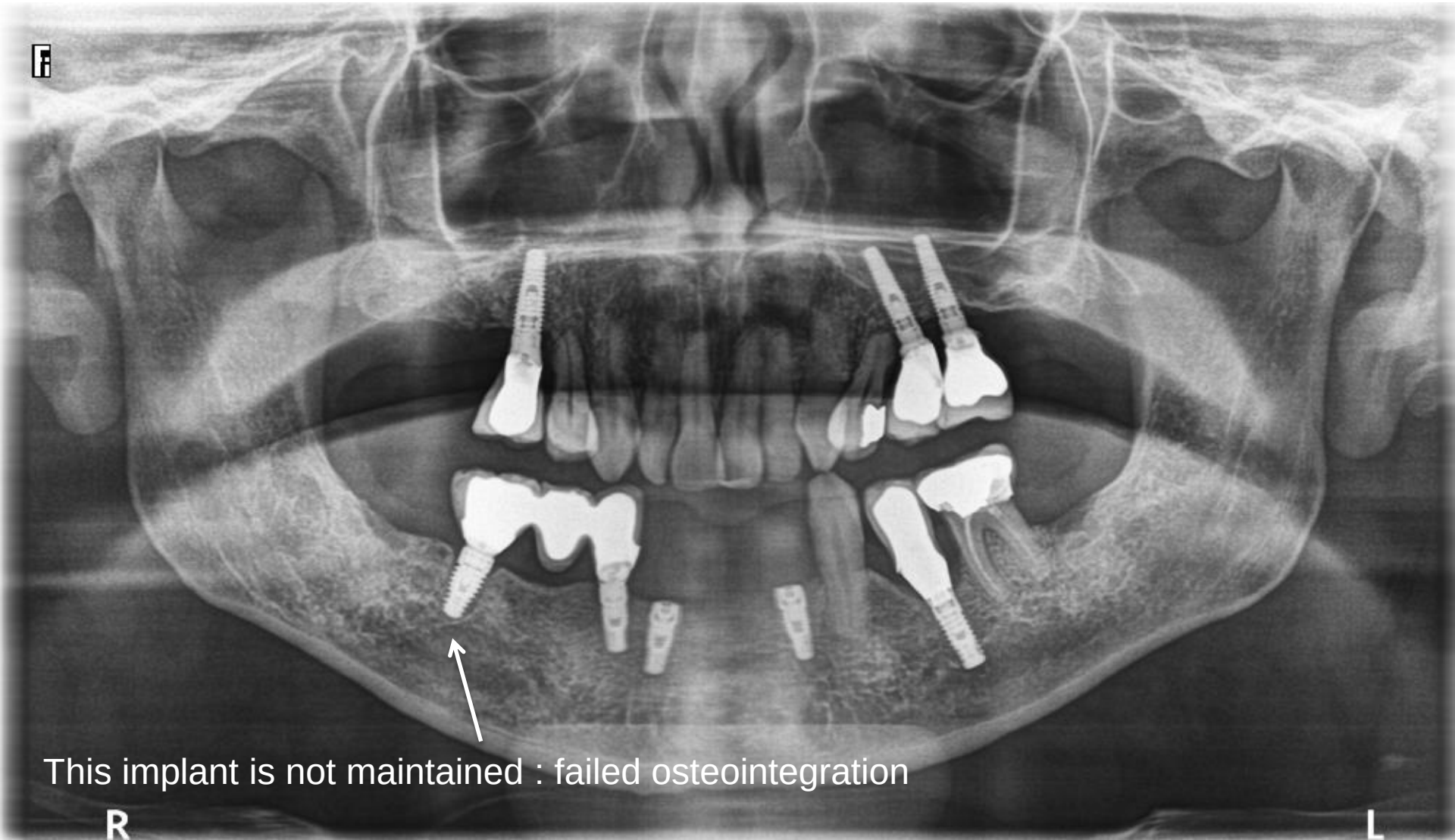


Sinusitis, dental origin

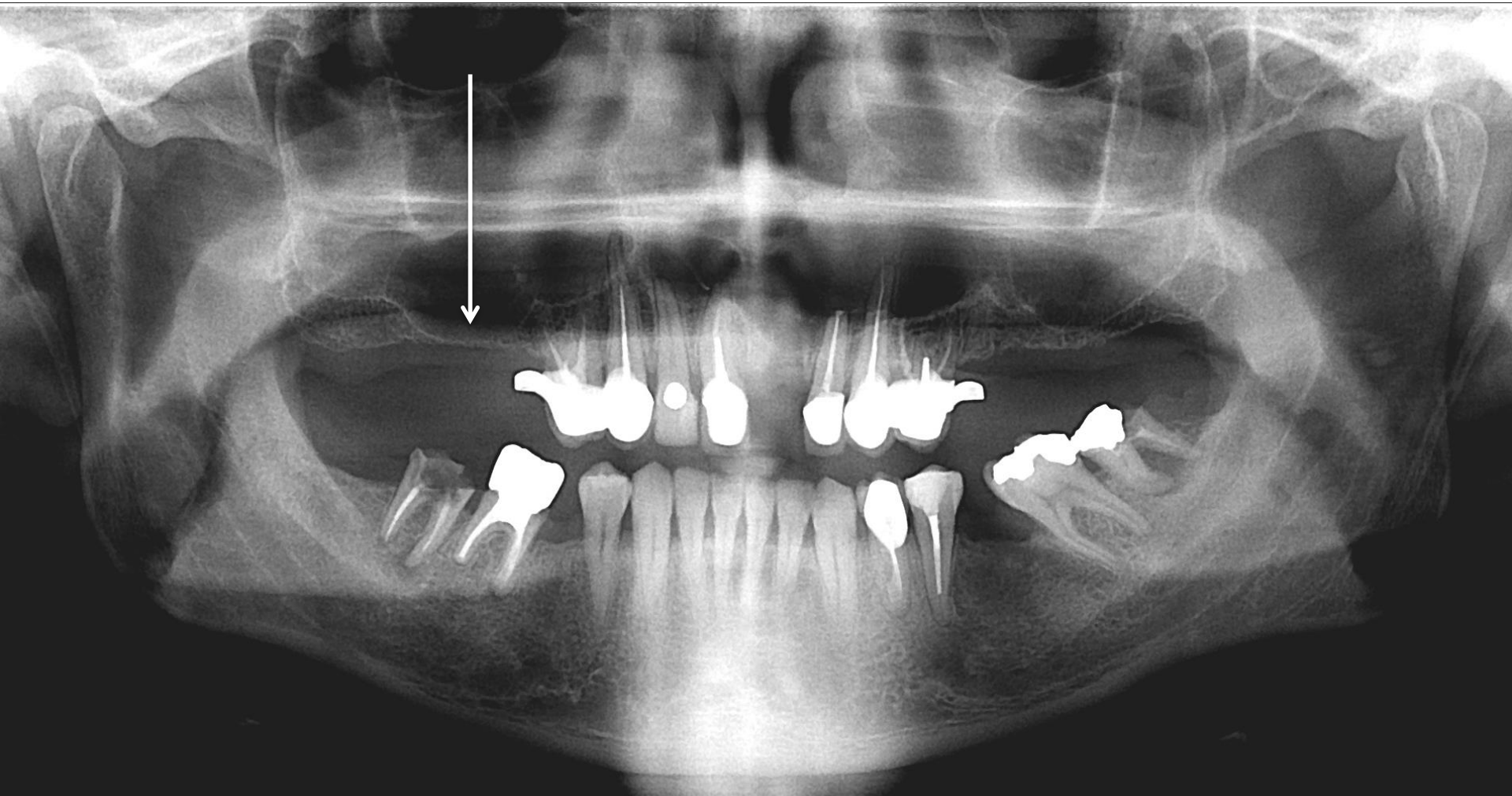
Chronic sinusitis

Both sinus appear more radio opaque

Osteointegration control

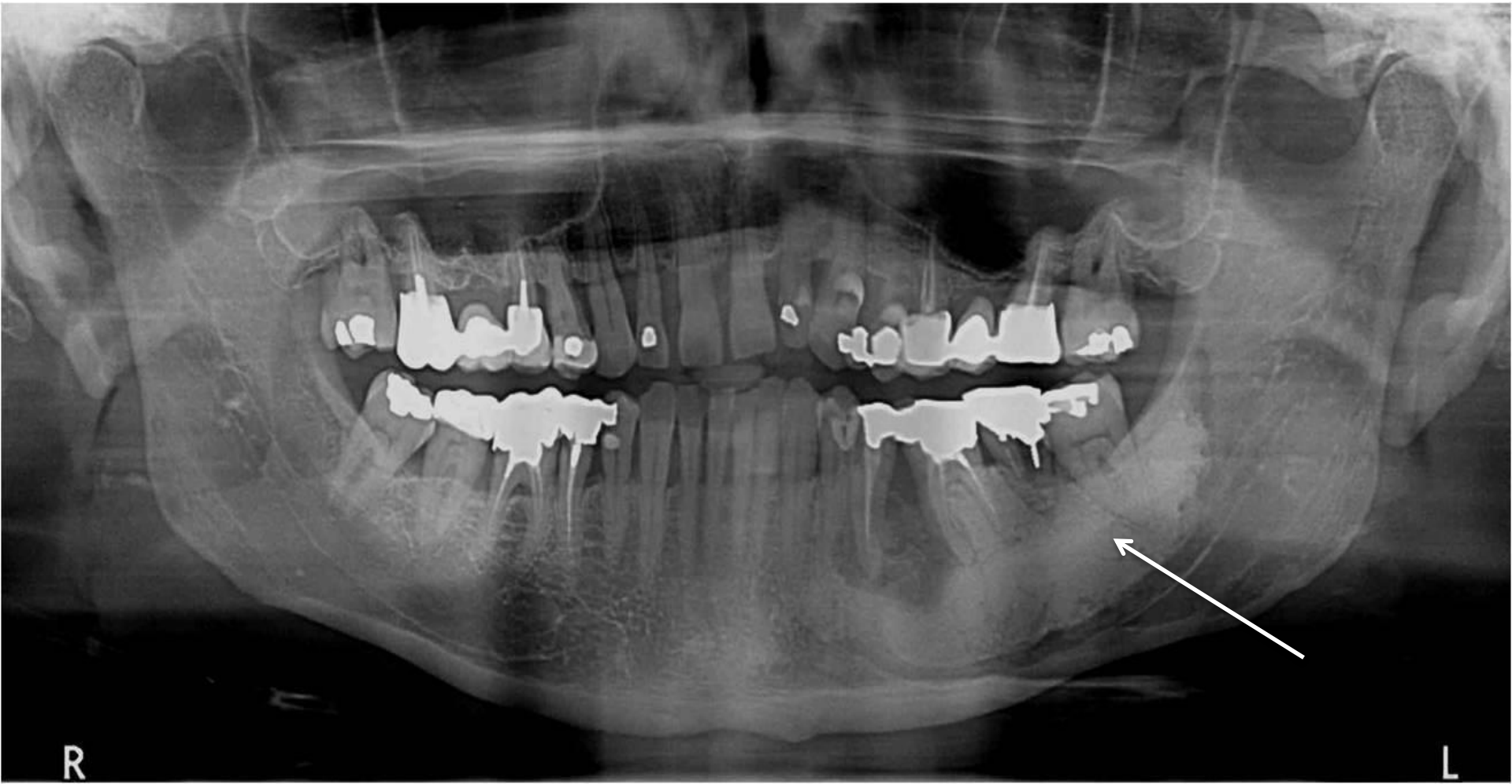


Thin maxilary bone rim

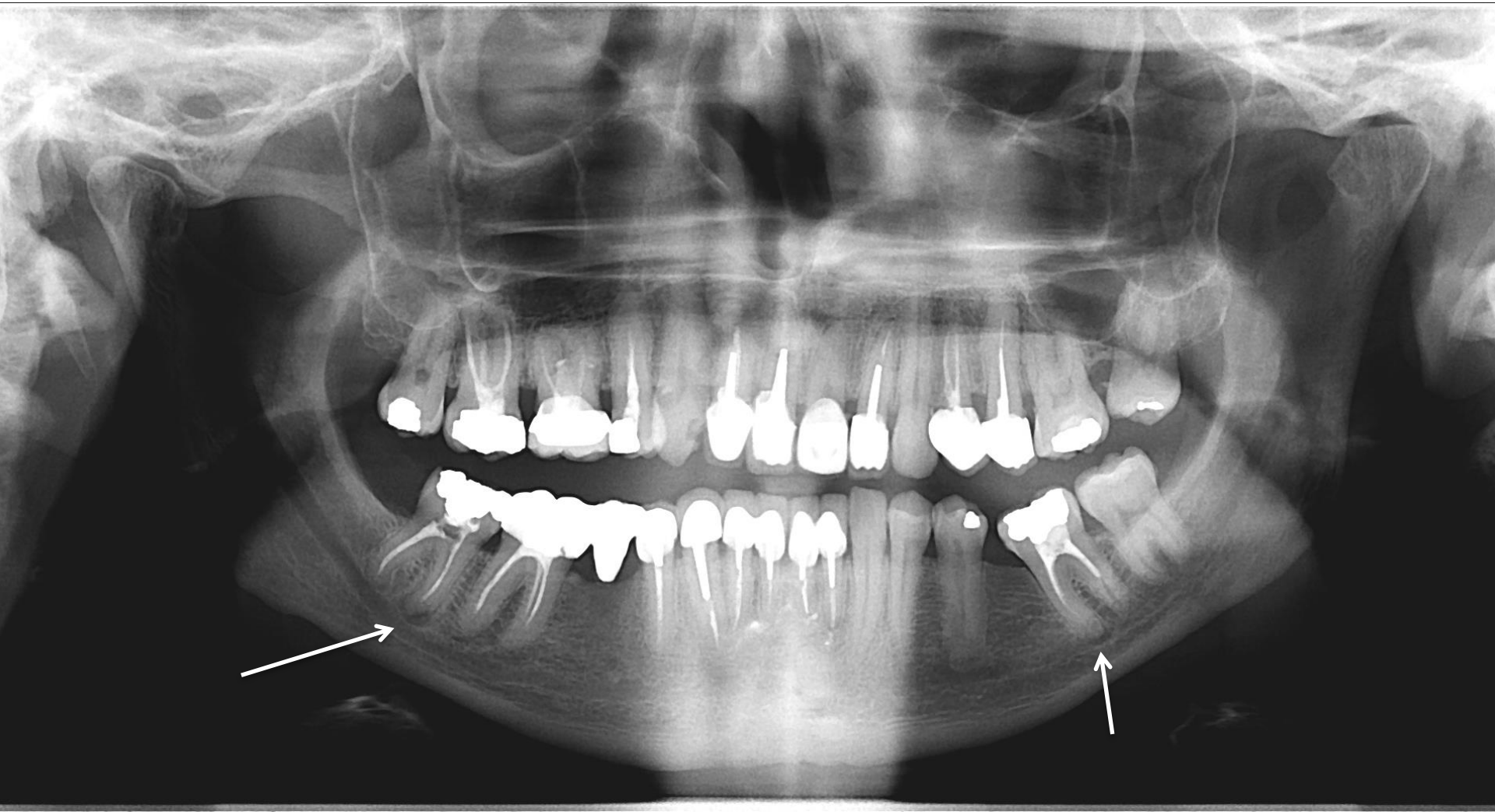


Low height of cortical bone rim in the mandible

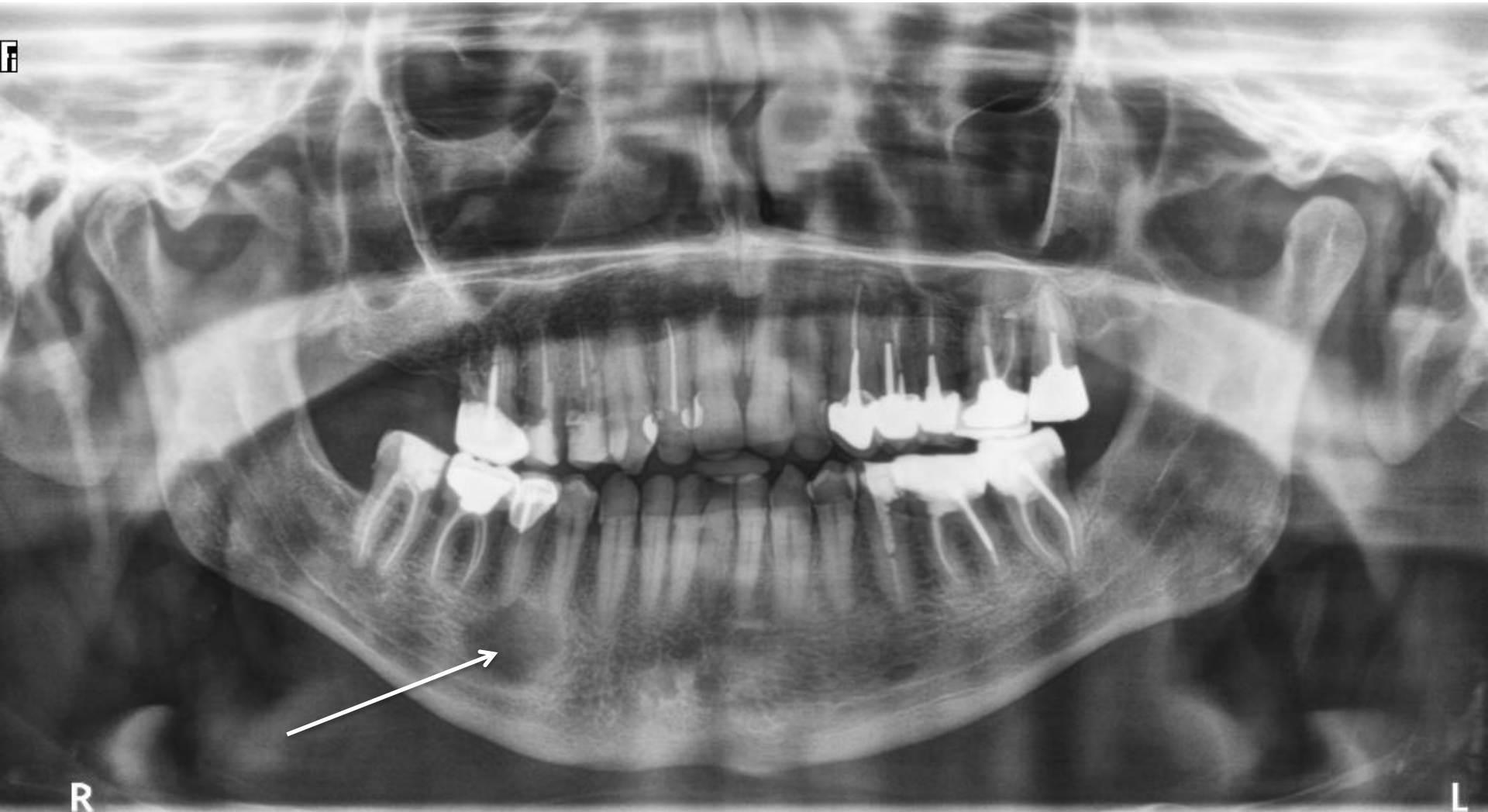
Osteitis



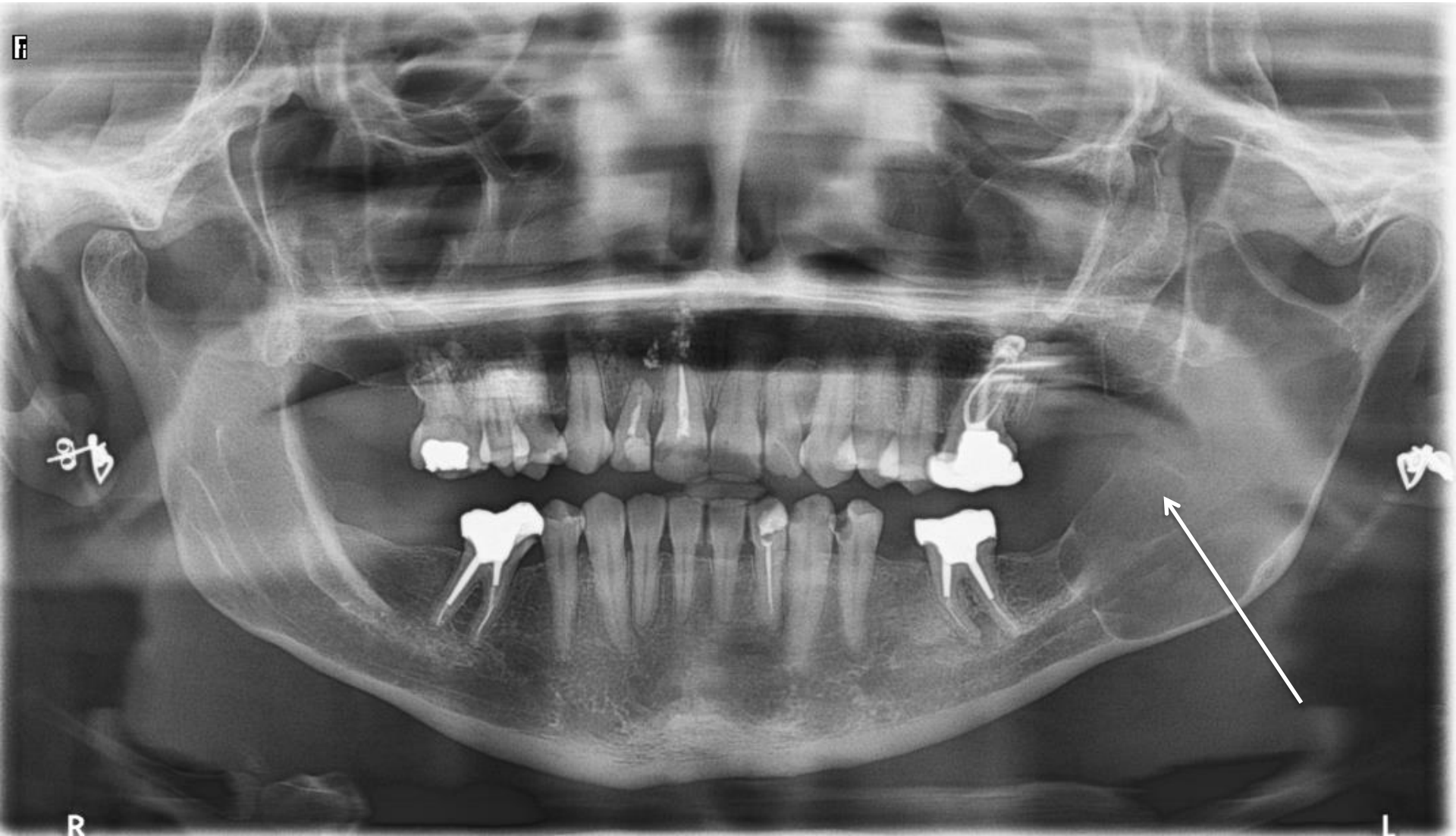
Granuloma or apical cyst



Granuloma

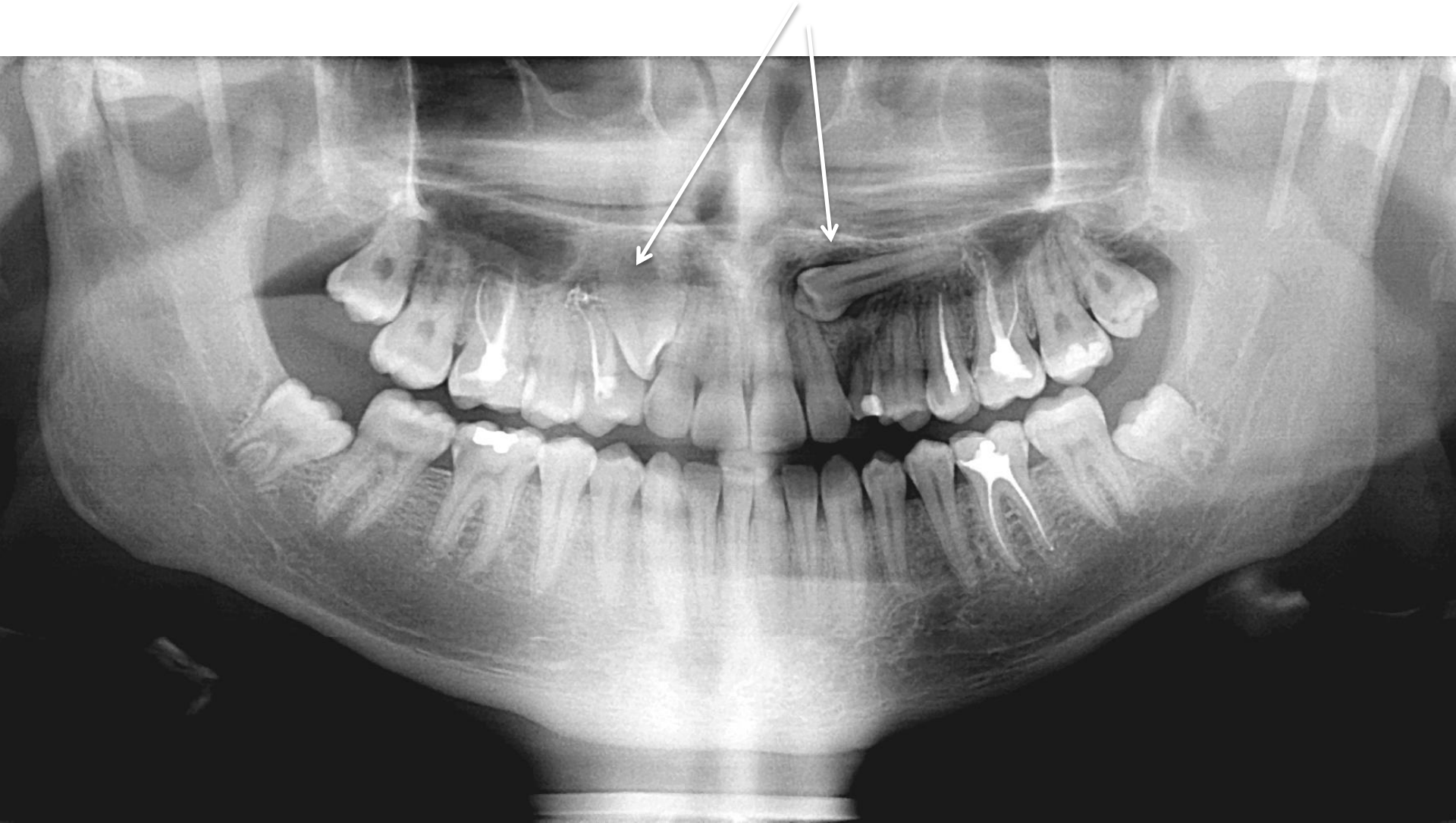


Lesion in the ramus



Orthodontics
Relationship between milk and final teeth

Impacted teeth



Impacted teeth

Periodontic

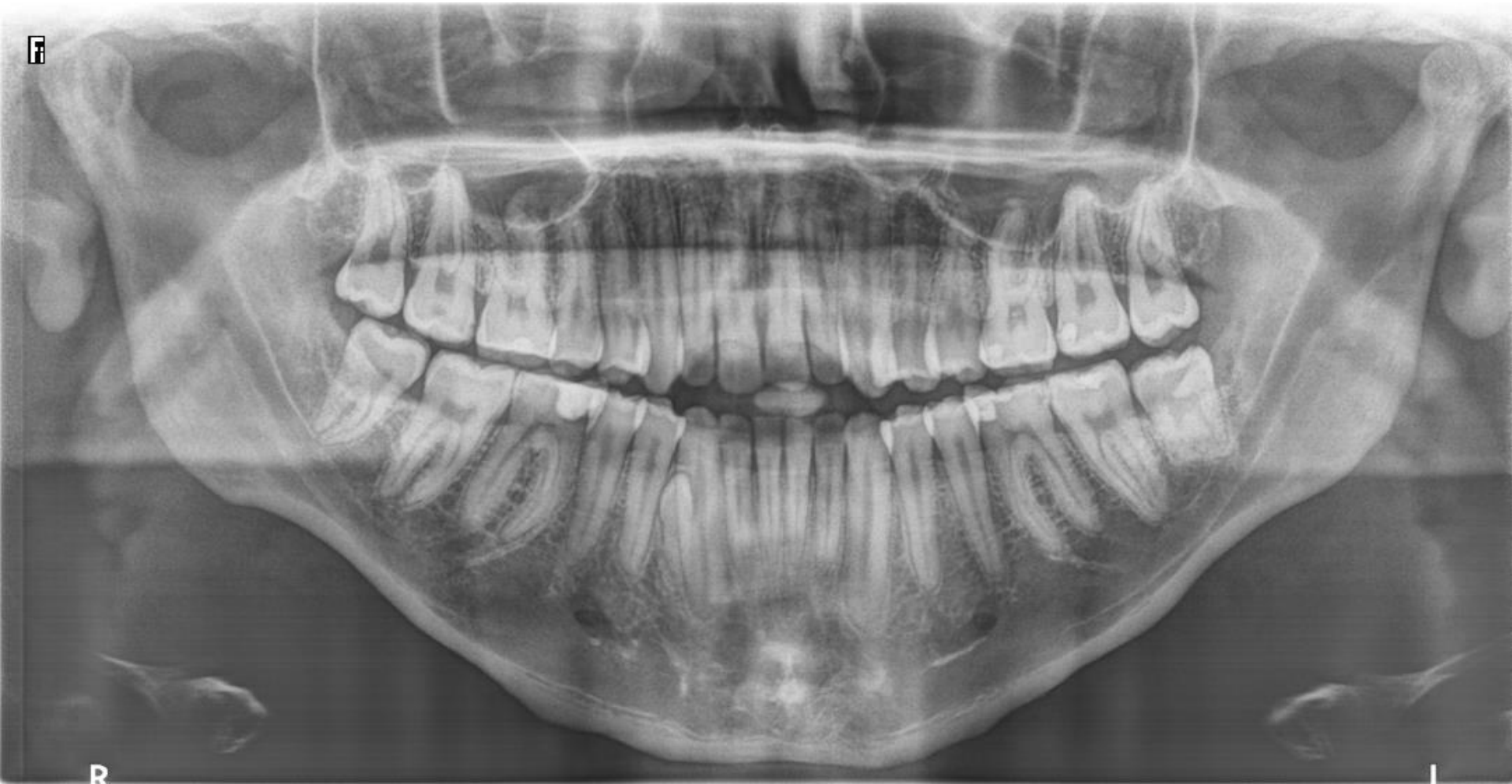
Horizontal bone loss

Wisdom teeth

Caries
(+perio vertical bone loss)

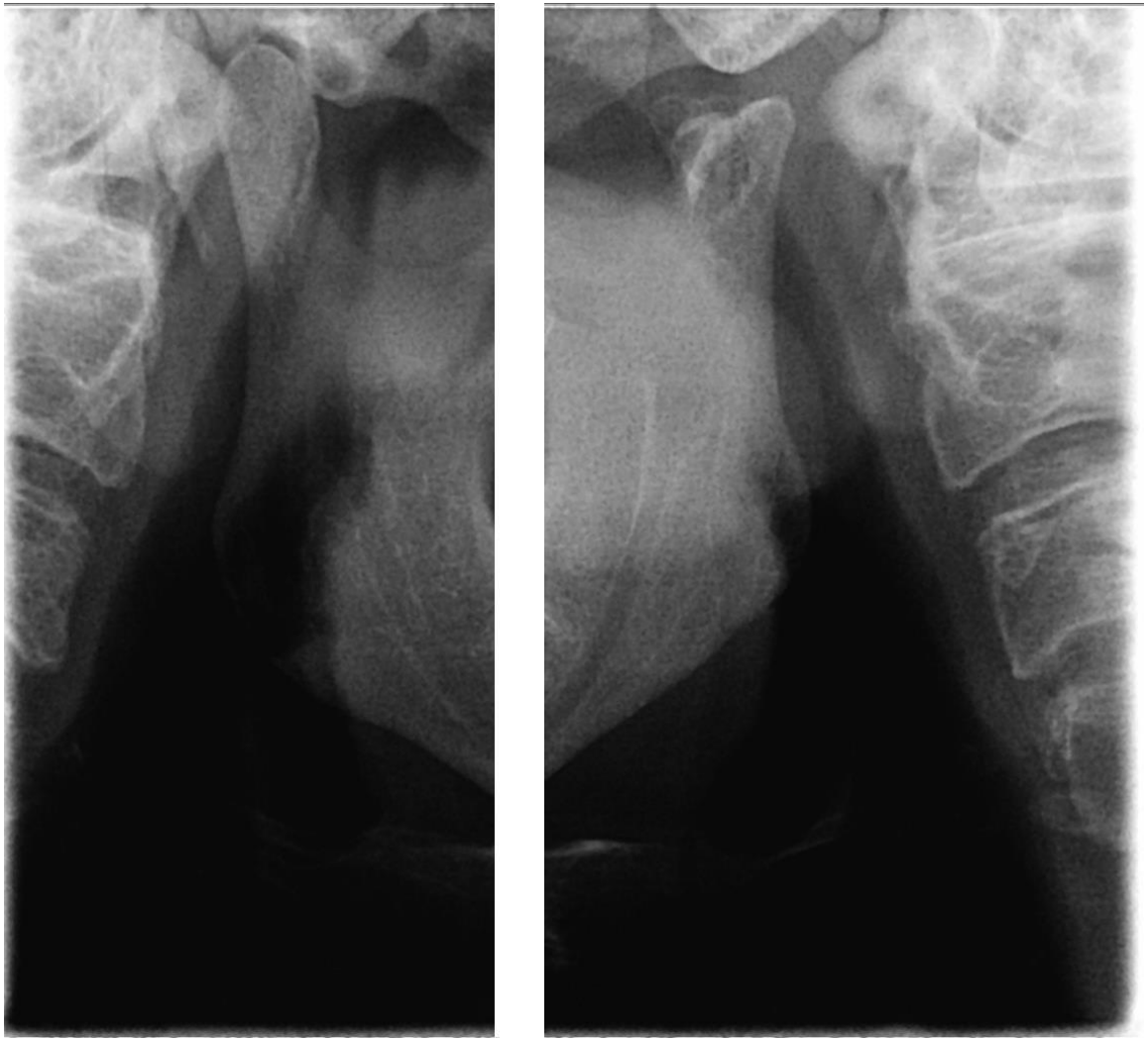
Missing teeth, agenesy

Supernumerary tooth



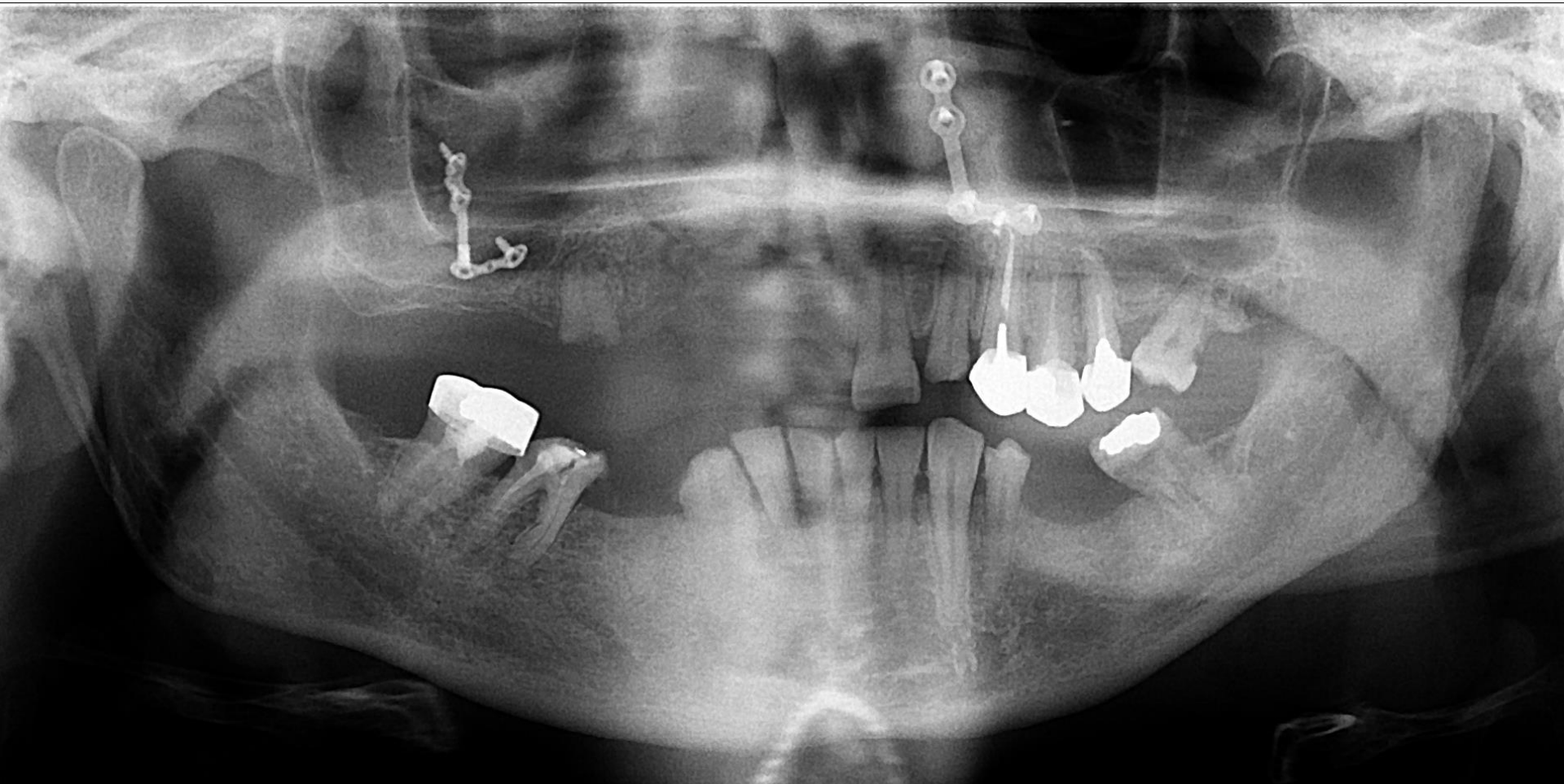
Tooth malposition

TMJ pathology

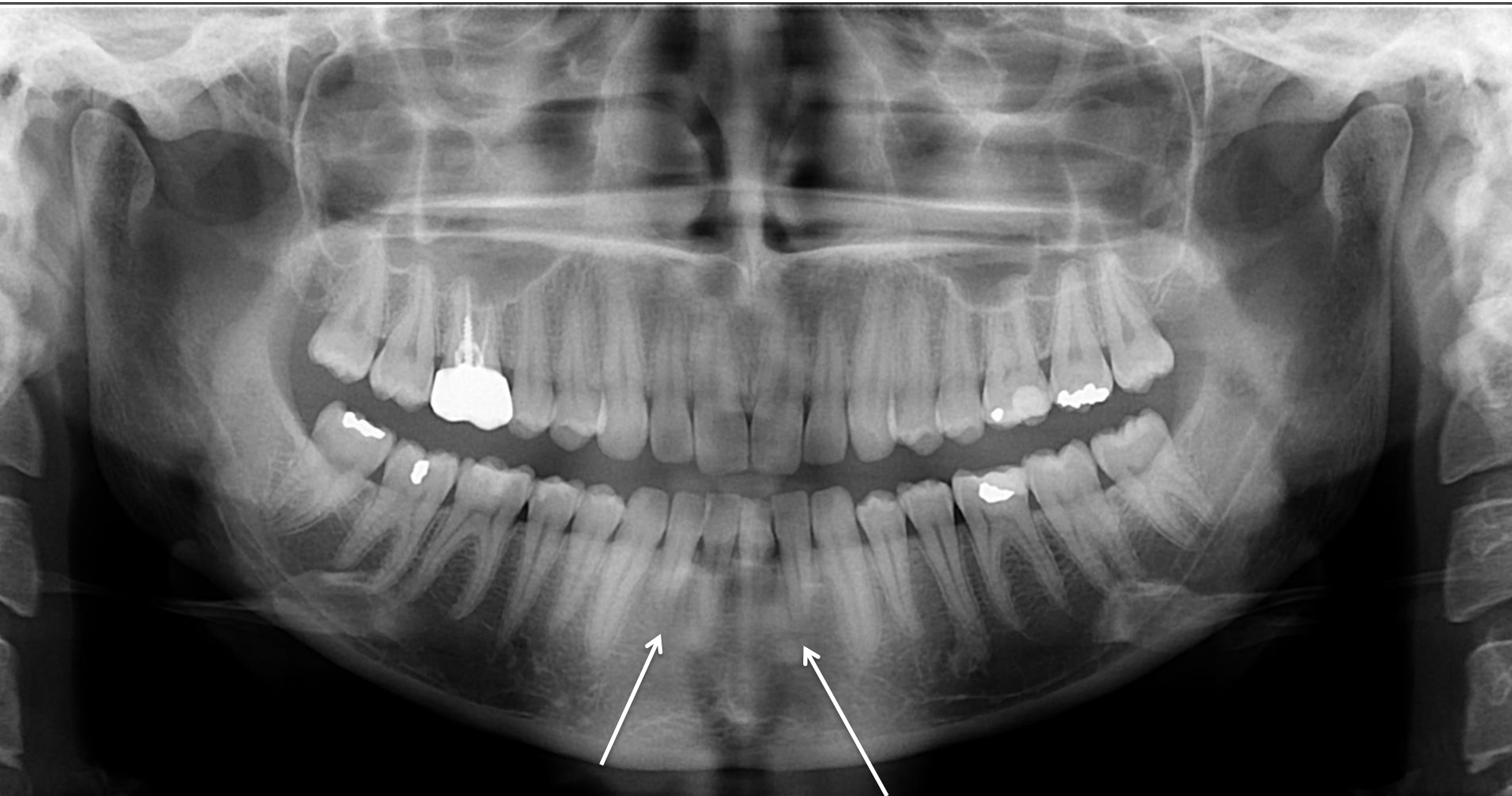


Fracture

Zygomatic bone consolidation

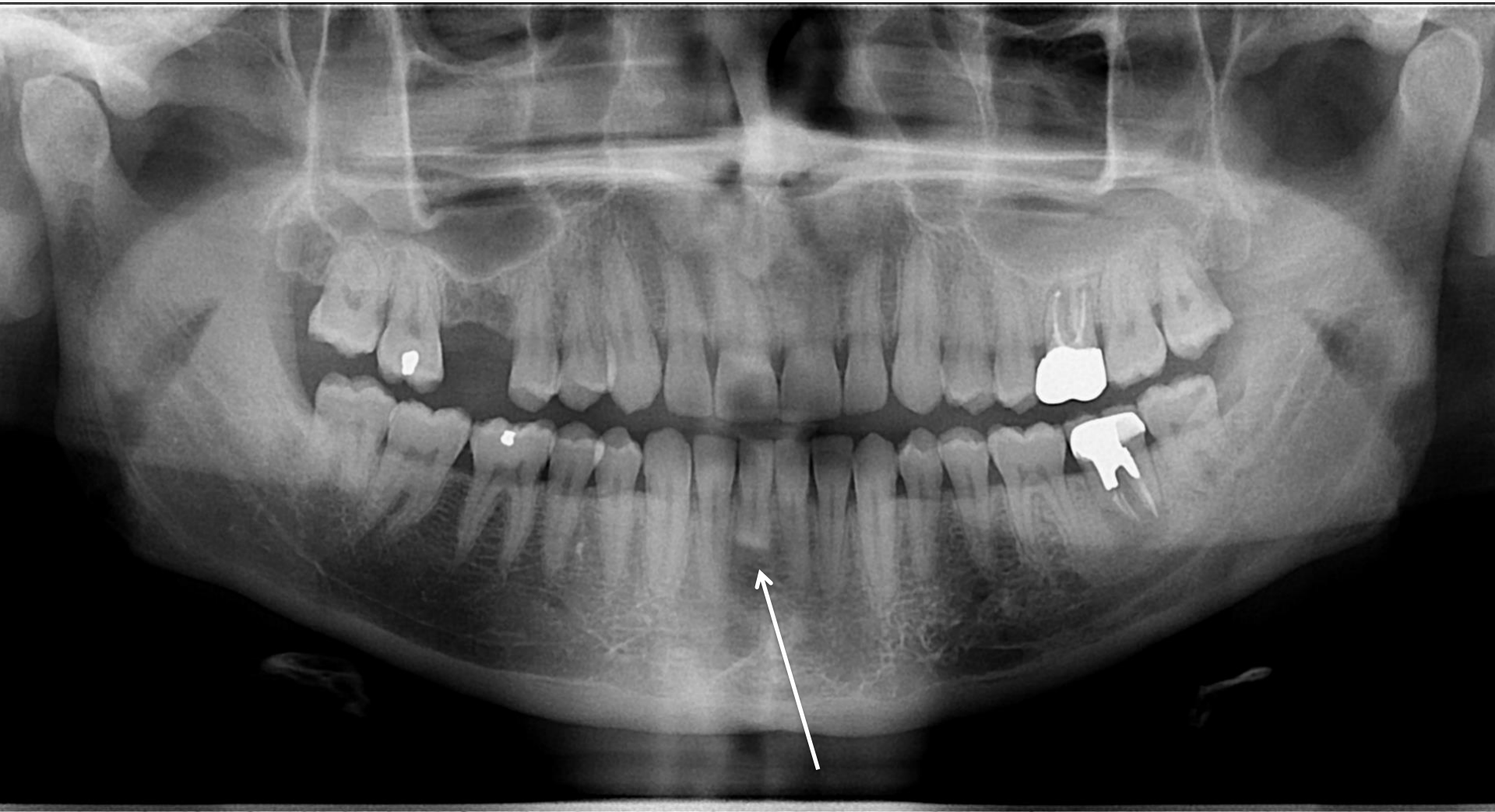


Radicular lyse by internal corrosion

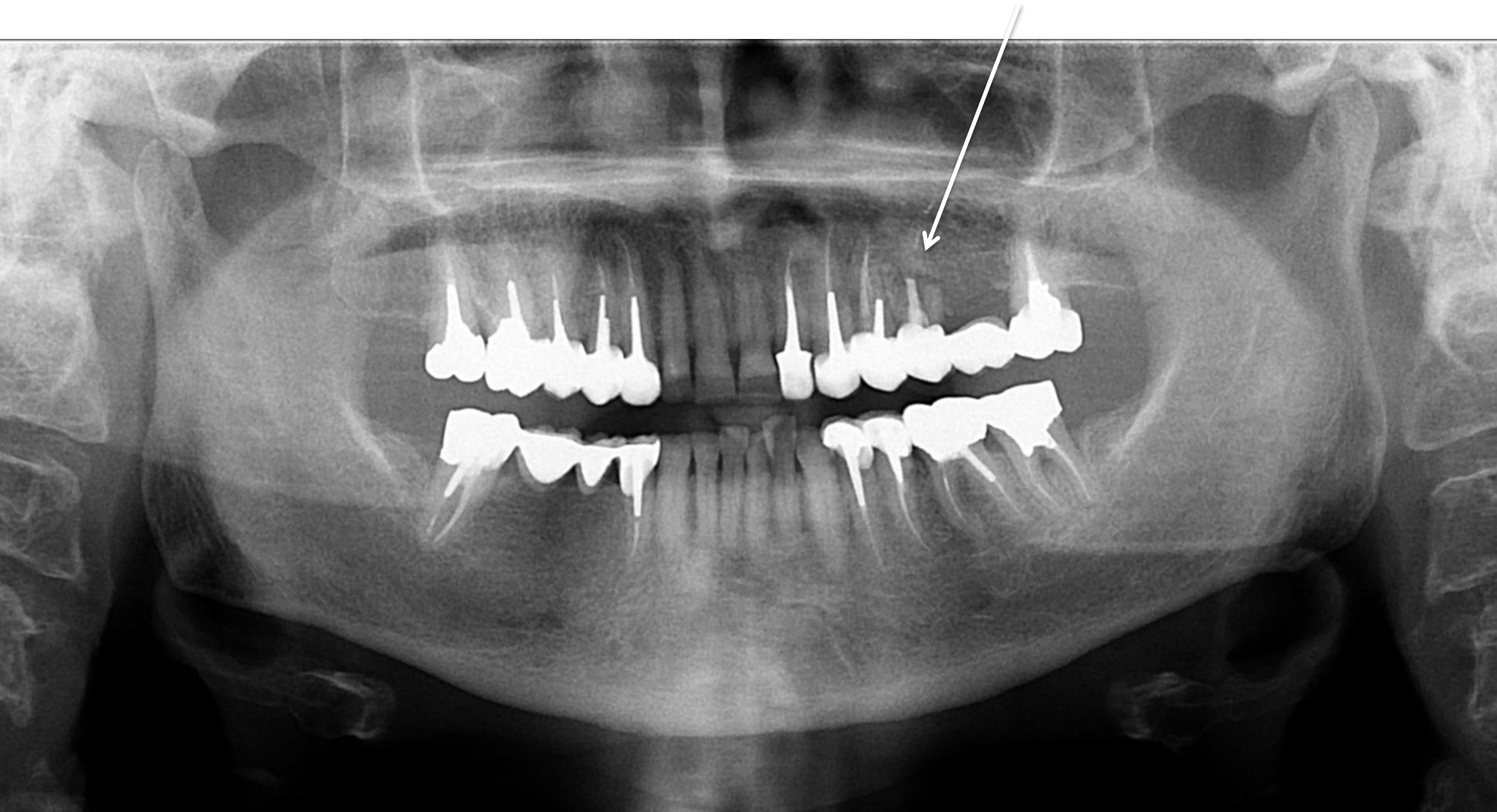


Residual rooth apex

Rhysalise (root resorption)



Radicular fracture



Artifacts

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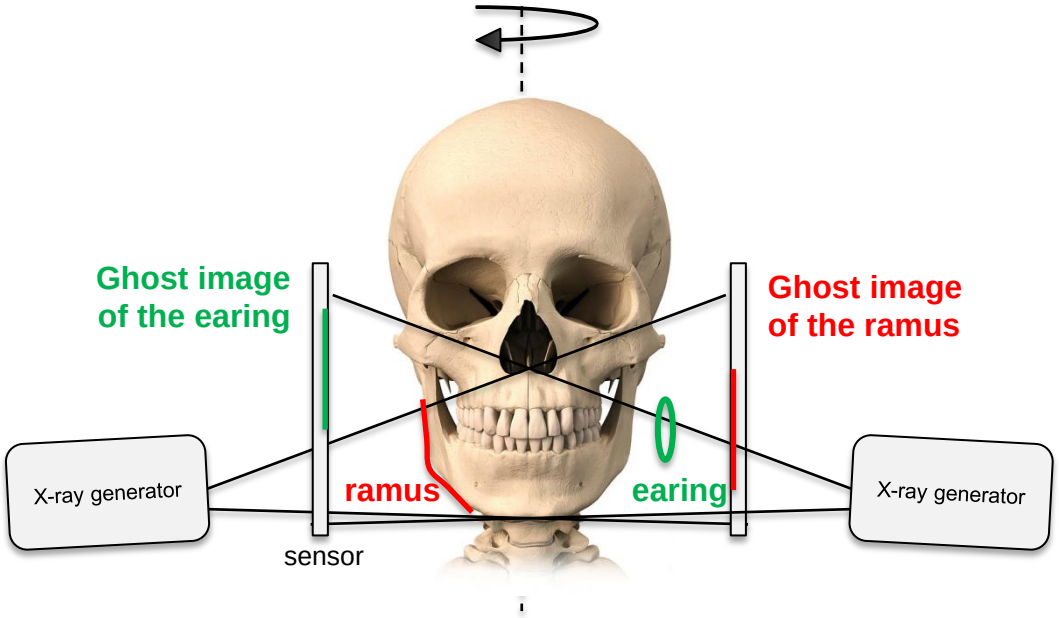
Ghost images

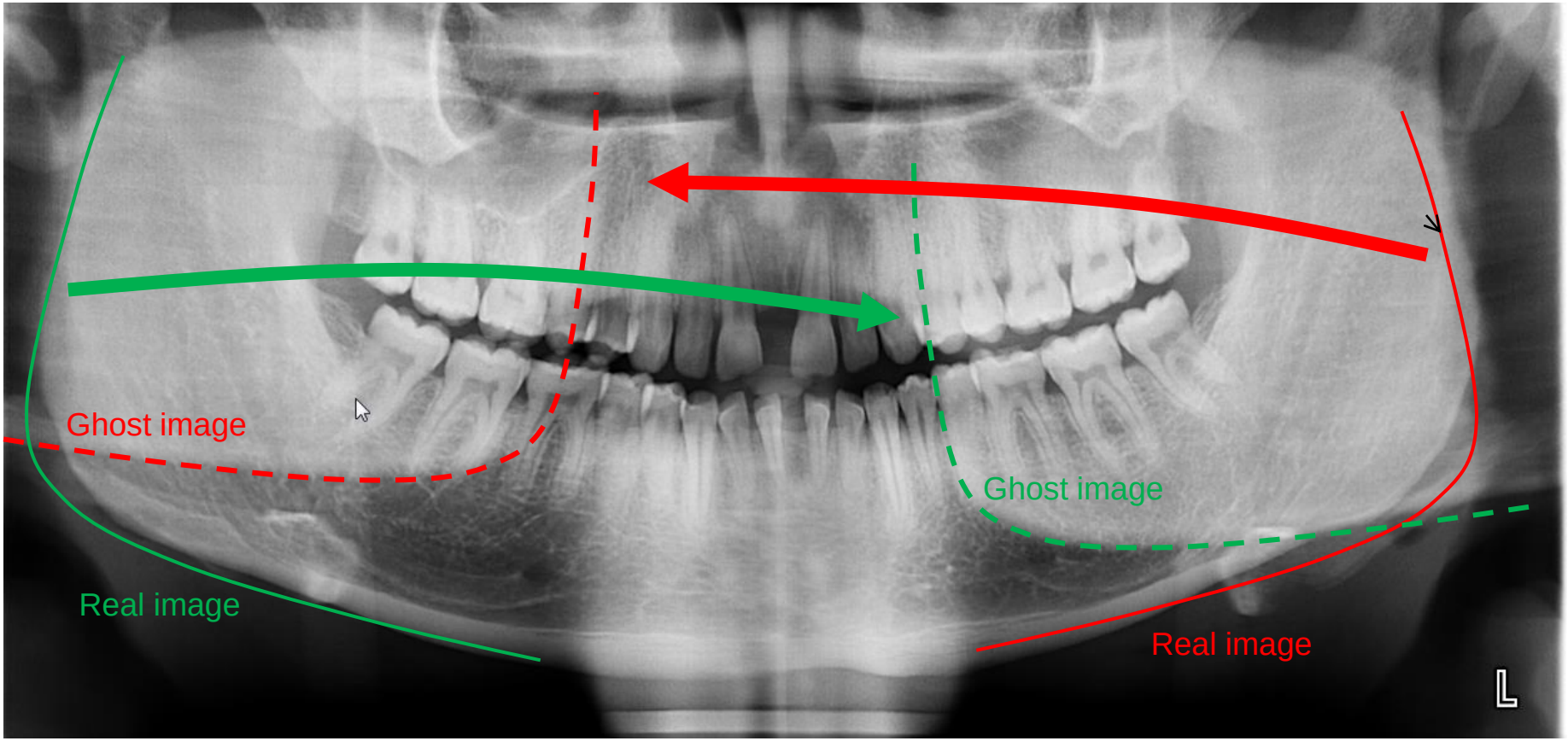
- Some structures/objects are located between the x-ray source and center of rotation : mandibular ramus, earings (!)…..
- These objects cast ghost images. They appear on the opposite side of the true anatomic location, and flipped.
- They appear blurred because outside the focal trough
- They are higher in the image than the real object, because of the x-ray beam upward inclination



Stuart C. White, M.J. Pharoah

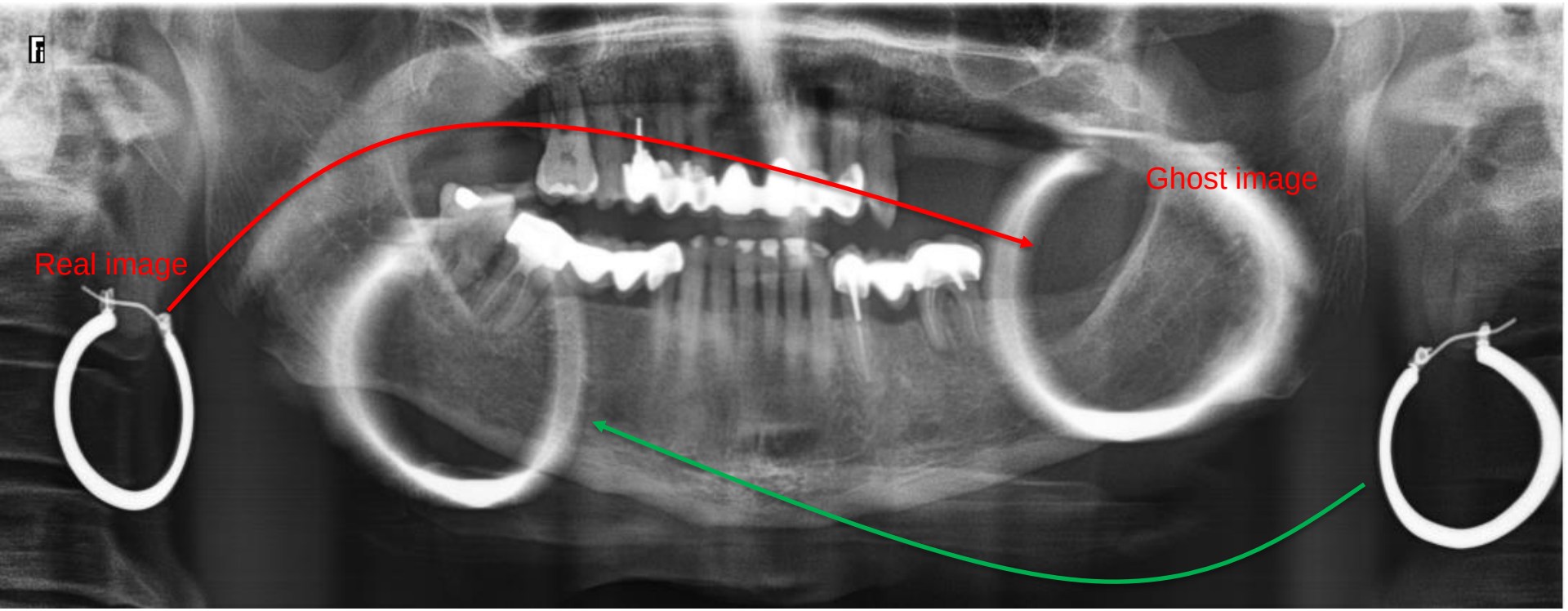
Ghost images

Example : **Mandibular ramus**



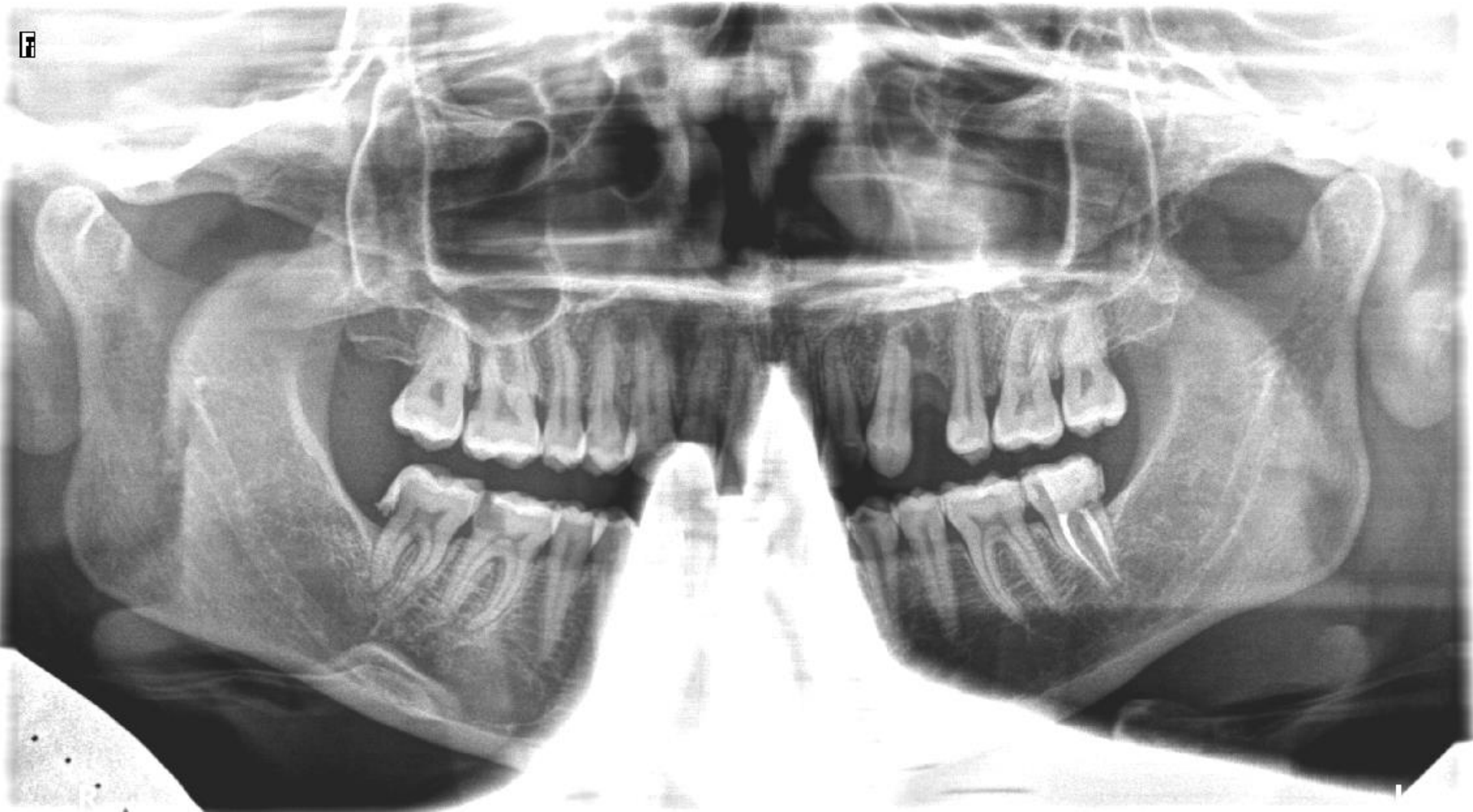
Ghost images

Example : **Earings**



Necklace

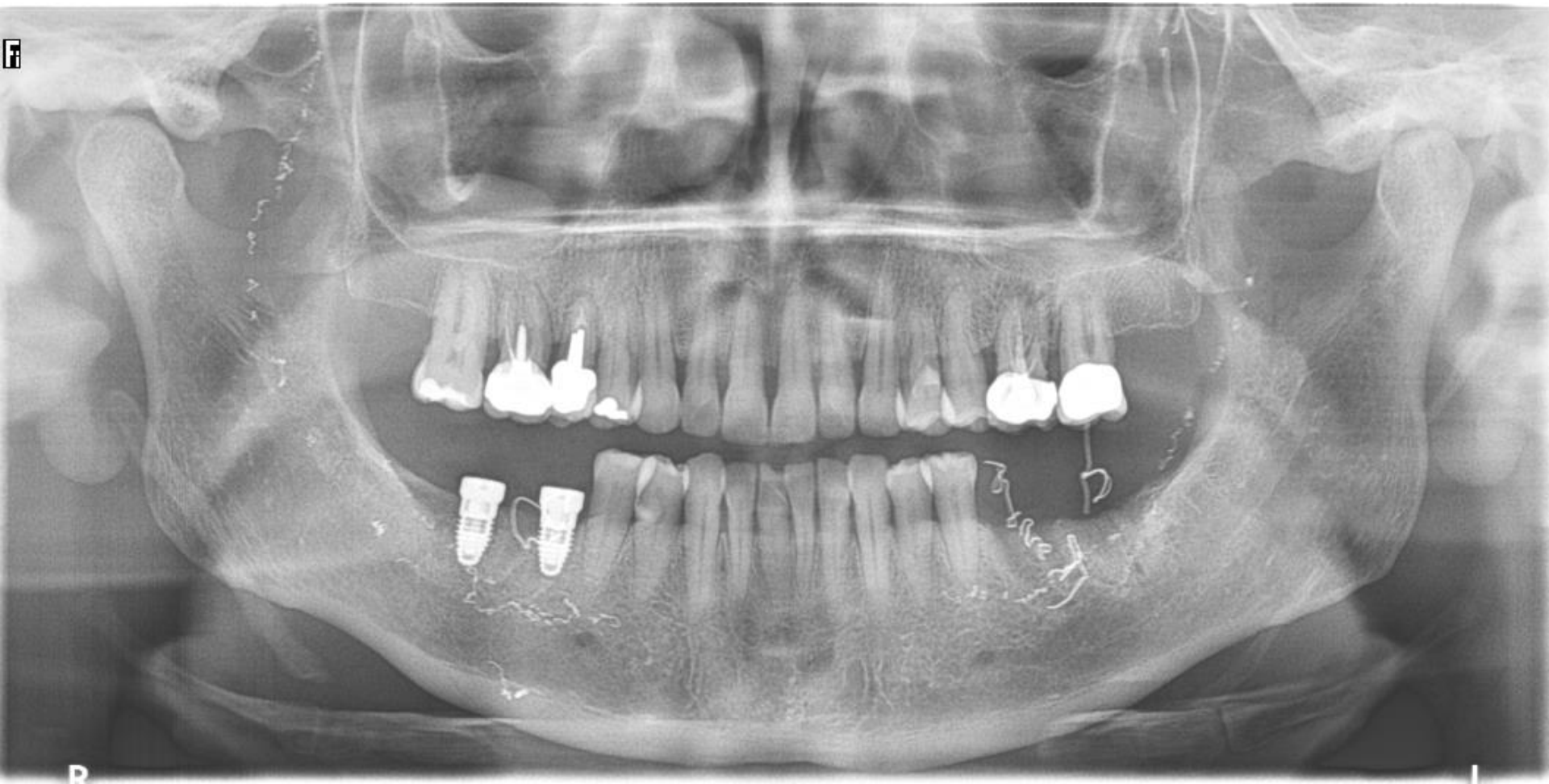
Lead apron



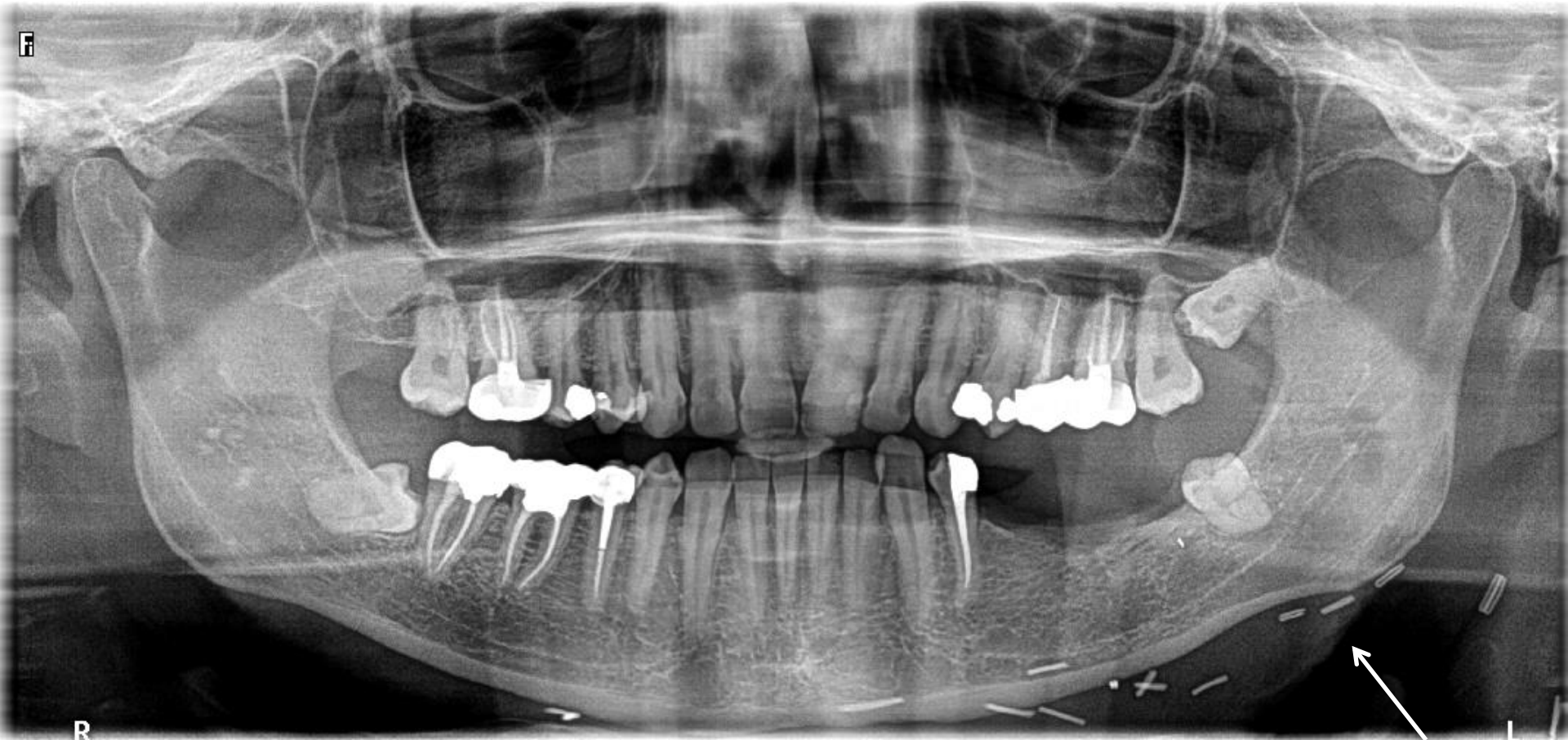
Glasses

Gold wires

Plastic surgery



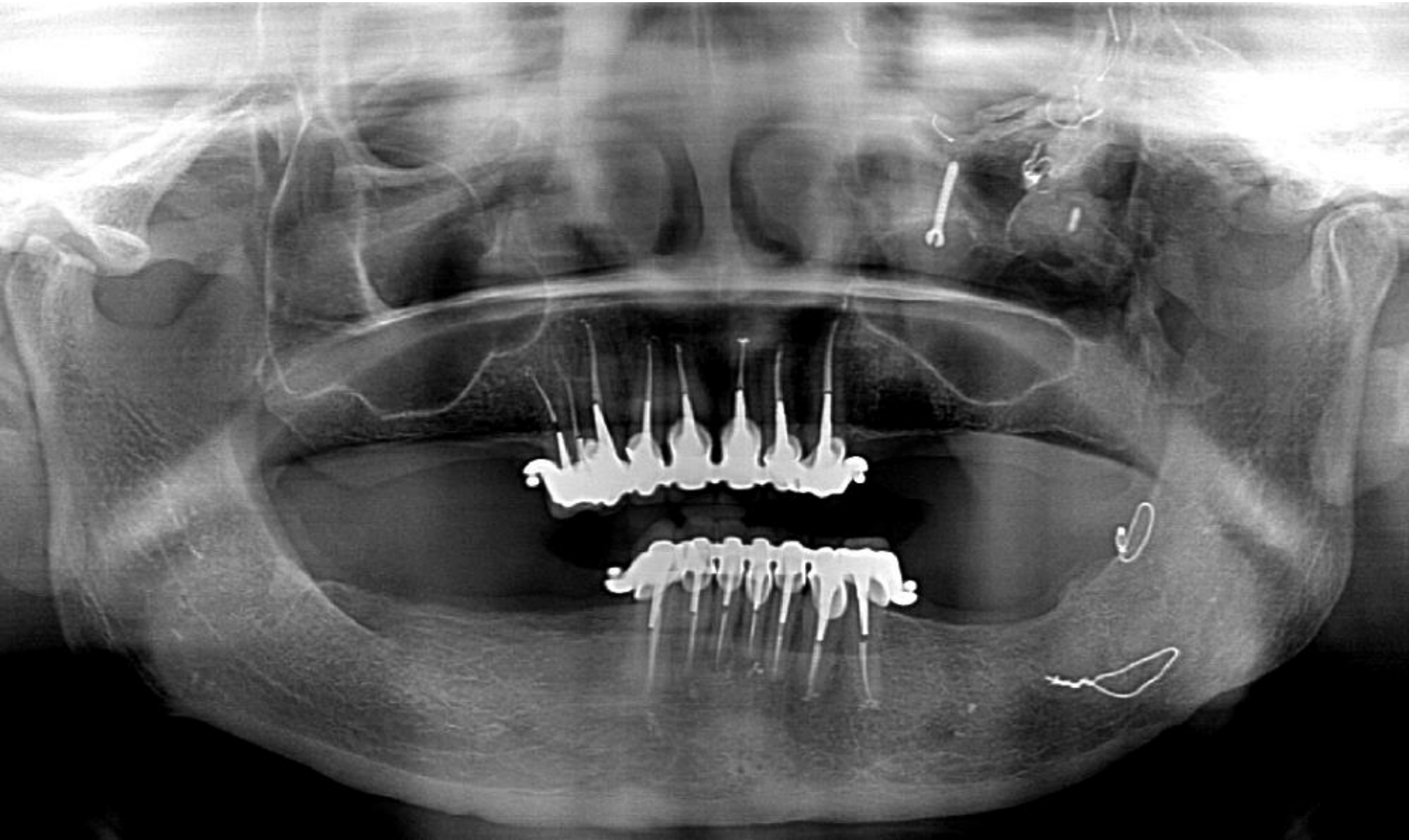
Vascular staples



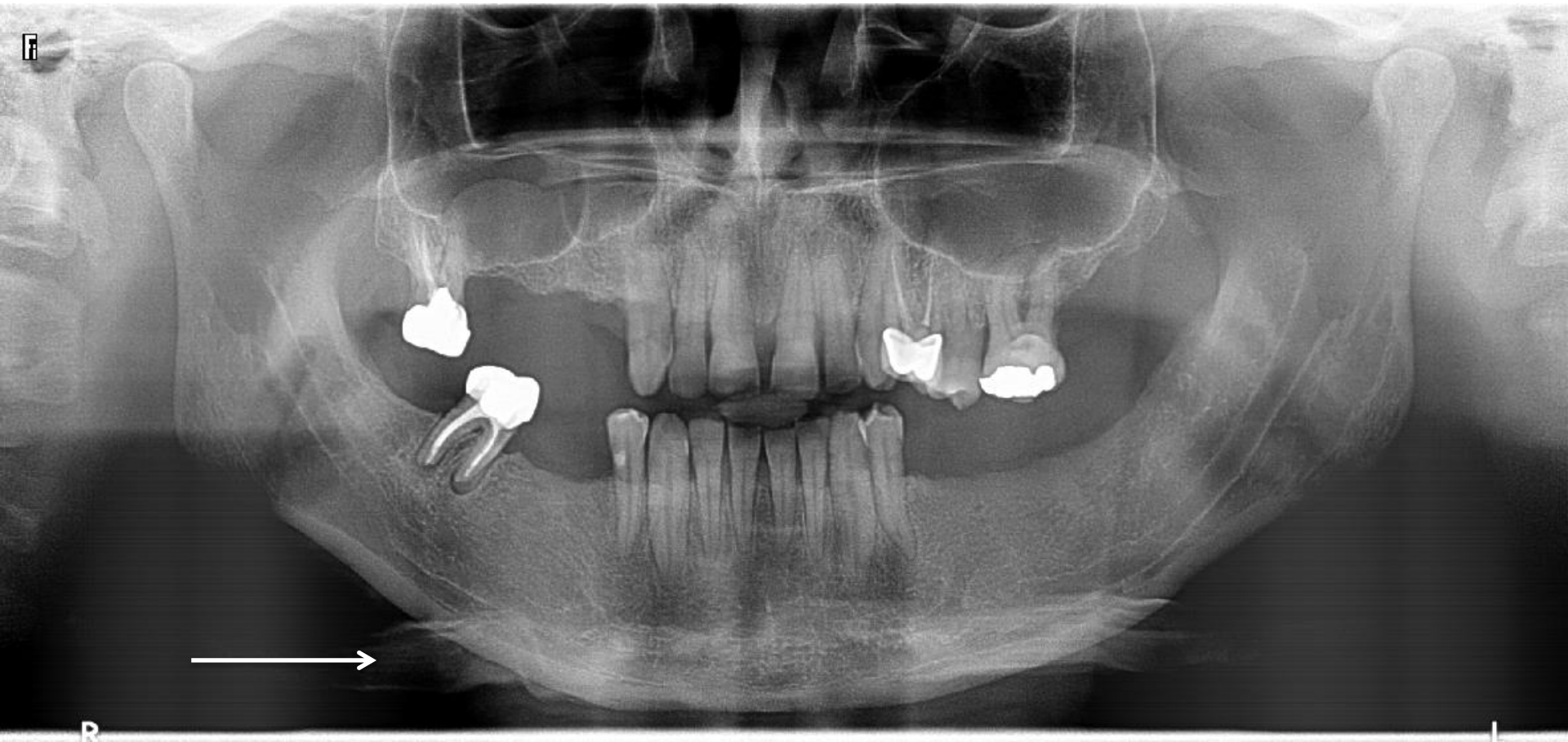
Earings + opened lips

Earings (big)
Prothesis

Maxilo facial surgery



Hyoid bone



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Addendum

Carestream Practical Guide to Panoramic Imaging

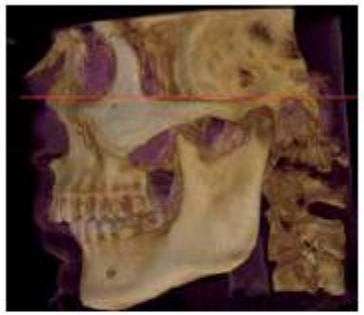
(extract)

Panoramic positioning

Although it is generally considered to be one of the easiest images to capture and can only provide a rough diagnostic examination, the panoramic image still requires precise patient positioning.

1. **Ask the patient to remove all metal accessories**
   - All jewelry (earrings, chains. etc.), hair accessories, eyeglasses, hearing aids and removable dental prostheses must be removed to prevent the projection of their image onto the plate concealing clinically relevant information.

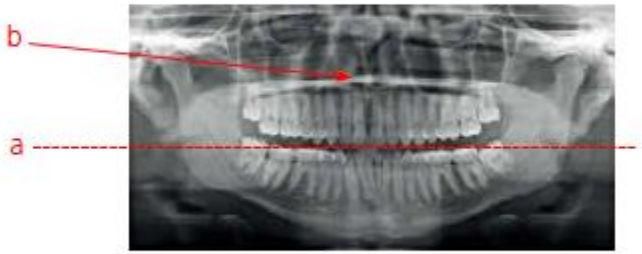
2. **Position the patient horizontally with a Frankfort plane**
   - The Frankfort plane is a "virtual" plane passing through the lower edge of the orbit (in front) and the upper edge of the external auditory canal.



Horizontal Frankfort plane

- Complying with this standard allows an almost rectilinear occlusal plane (a) to be obtained, the hard palate is at a tangent to the direction of the beam and is therefore not divided (b), and teeth from different sectors will be included in the panoramic cutting plane (and will be clear and without enlargement of the apices).

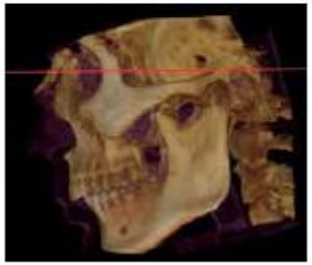
Panoramic positioning

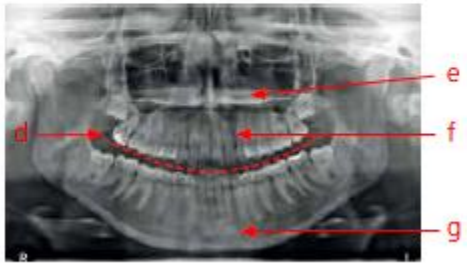


- If this positioning guide is not followed, the occlusal plane will be excessively curved, the hard palate will be divided in two, and the teeth will appear too large or too small (depending on the angle of the Frankfort plane).

<u>Incorrect positions:</u> Head/chin too low

- Result:
  - deformed occlusal plane (d)
  - divided hard palate (e)
  - upper anterior teeth magnified (f)
  - lower anterior teeth minified and outside the panoramic reference plane (blurred) (g)

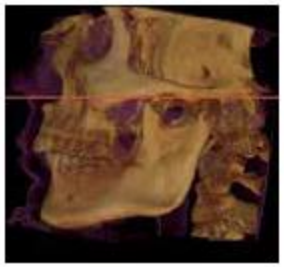


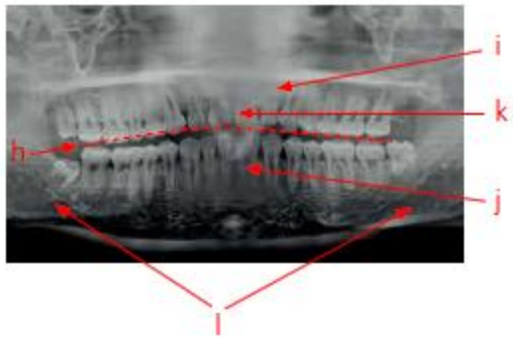


Panoramic positioning

Incorrect positions: Head/chin too high

- Result:
  - deformed occlusal plane (h)
  - divided hard palate (i)
  - apical roots of the upper anterior teeth magnified (j)
  - upper anterior teeth minified and outside the panoramic reference plane (blurred) (k)
  - appearance of a trail of deletion caused by out-of-field structures (l)





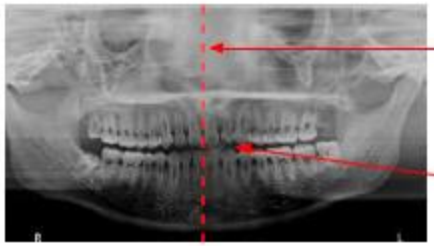
3. Position the median plane of the patient correctly

- To prevent axial deformations and asymmetry of anatomical structures, the operator must ensure that the patient is correctly centered in the unit and that the patient is properly biting down on the bitestick

Panoramic positioning

If this positioning guide is not met, there is asymmetry of the ascending branches. In extreme cases, one of the arches will be blurred, the teeth will appear stretched and one of the TMJs may be truncated.

Median or Mid-Sagittal line



Mid-Sagittal plane of the patient

"Bite" offset to the left

4. Ask the patient to place the tongue on the palate

- Reason: To expel air from the buccal cavity which will then create a homogenous density throughout the upper anterior teeth and through the angle of the mandible.