



Cariology II

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Caries classification (BLACK – 5 CLASSES)

- I. class - molars, premolar, occlusal surfaces - fissures, foramina (pits)
- II. class - molars, premolars - approximal surfaces
- III. class - frontal teeth - approximal surfaces
- IV. class - frontal teeth - incisal corners lost
- V. class - cervical region - oral, vestibular

Source: www.dent.ucla.edu

Mount-Hume classification system (SiSta)

The 12-way guidance grid		Size			
		1 Minimal	2 Moderate	3 Enlarged	4 Extensive
Site	1 Fissure	<u>1.1</u>	<u>1.2</u>	<u>1.3</u>	<u>1.4</u>
	2 Proximal	<u>2.1</u>	<u>2.2</u>	<u>2.3</u>	<u>2.4</u>
	3 Cervical	<u>3.1</u>	<u>3.2</u>	<u>3.3</u>	<u>3.4</u>

- 
- Primary
 - Secondary
 - Recurrent
 - Arrested



Caries localization

- Coronary
- Fissures and pits
- Free smooth surfaces
- Approximal surfaces
- Root
- Caries in enamel
- Caries in dentine
- Caries in cement

Table 15 Clinical carious lesions related to type, localization, size and depth, and shape

Type	Localization		Size/depth	Shape
Primary caries	Crown	Occlusal surfaces Free smooth surfaces (buccal and lingual)	Enamel caries (incipient; D ₁ , D ₂)	Smooth surface Rough surface Cavitation
		Approximal surfaces Supragingival or subgingival	Dentin caries (manifest; D ₃ , D ₄)	Without cavitation Cavitation into enamel Cavitation into dentin Cavitation into pulp
Secondary caries (recurrent)	Crown	Occlusal surfaces Free smooth surfaces (buccal and lingual)	Enamel caries (incipient)	Smooth surface Rough surface Cavitation
		Approximal surfaces - Supragingival or subgingival	Dentin caries (manifest)	Without cavitation Cavitation into enamel Cavitation into dentin Cavitation into pulp
Primary caries	Root	Buccal, lingual, mesial, distal	Cementum caries (surface or incipient)	Soft surface (active lesion) Arrested surface
		Supragingival or subgingival	Dentin caries (manifest)	Without cavitation Cavitation
Secondary caries	Root	Buccal, lingual, mesial, distal	Cementum caries (surface or incipient)	Soft surface (active lesion) Arrested surface
		Supragingival or subgingival	Dentin caries (manifest)	Without cavitation Cavitation

From Axelsson (1994).



Diagnosis of dental caries

What is diagnosis?

Diagnosis is the art or act of identifying a disease from its signs and symptoms
(Webster's Dictionary)

Diagnosis of dental caries

Caries diagnosis

the intellectual course that integrates information obtained by clinical examination of teeth, use of caries diagnostic aids, conversation with the patient and biological knowledge

consists of

inspecting the teeth

immediate surrounding

additional aids




Diagnosis of dental caries

Significance

1. forms basis for a treatment decision (D1,D2,D3,D4)
2. enables the professional to advice and inform the patient (and parents)
3. at a population level it advises health service planners

Caries in enamel

Detection of white spot lesion



Progression of enamel caries

Caries reaches the amelodentinal junction

Caries of the dentine-pulp complex

- Detect
- Diagnose
- Record



The caries diagnostic examination

Clinical visual examination

1. Systematic
2. Clean
3. Illumination
4. Dry
5. Push the sharp probe away
6. Radiographs
7. Caries risk assessment

The caries diagnostic examination

1. Systematic
according the system of charting
2. Clean
tooth cleaning before examination, or tooth polishing in surgery, plaque removal in surgery after its disclosing
3. Illumination
good operating light
dental mirror
transillumination : operating light reflected through the contact points of anterior teeth using dental mirror – caries = dark shadow (demineralized area has a lower index of light transmission than sound tooth structure)
Magnifying glasses (systems)

The caries diagnostic examination

4. Dry
relative refractive indices:
- | | |
|--------|------|
| air | 1.0 |
| water | 1.33 |
| enamel | 1.62 |

White spot lesion dried – air replaces the water in the porous tissue. The refractive index of air is farther away from enamel – lesion becomes easier to see.

5. Push the sharp probe away
Probing can cause traumatic defects in lesions that can be arrested by plaque control alone (conversion of a subsurface defect to a frank cavity).
Probe – indispensable part of the caries diagnostic armamentarium

but

The tip of the probe – very delicate tactile instrument – used gently, without pressure, then valuable information about the consistency and texture of the surface.

6. Radiographs
orthopantomogram
periapical
bitewing

When bitewing radiography for caries diagnosis is justified.
How long the intervals between radiographic examinations should be.

International Commission on Radiological protection (ICPR):
No practice involving exposure to radiation should be adopted unless it produces sufficient benefit to the exposed individuals and the magnitude of individual doses should be kept as low as reasonably achievable, economic and social factors being taken into account

Radiography must not be routinely used for all patients

Individual grounds

Clinical indications for every radiograph

Conventional versus digital radiography

digital radiography – radiation dose is reduced substantially

but little documentation on its utilization

number of retakes, improved diagnostic effectiveness, economic benefits

Bitewings – for diagnosis of approximal caries

not very reliable for occlusal caries (combination of more methods)

false-positive diagnosis in the enamel-dentin area (Mach band effect, cervical burn-out))

The caries diagnostic examination

7. Caries risk assessment

Previous disease :

presence of restorations
previous extractions
new disease

Dietary factors

Social factors

Fluoride use and plaque control

Medical history

Saliva

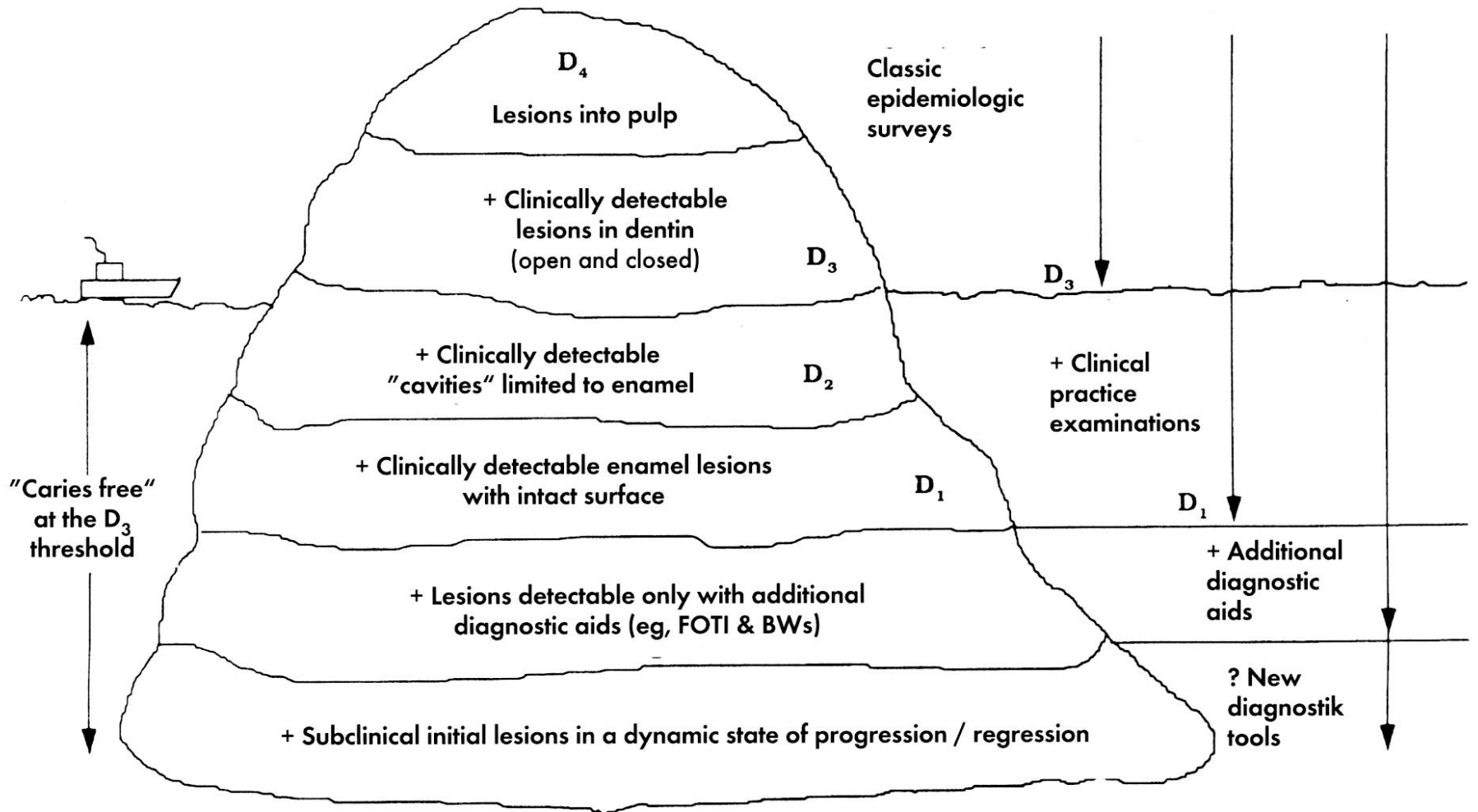
Bacteria

Fissure shape

Risk categories

high, moderate low

Cariogram





Advanced methods for caries diagnosis

1. Magnification
2. Temporary tooth separation (TTS)
3. Diagnostic methods based on applied physical properties



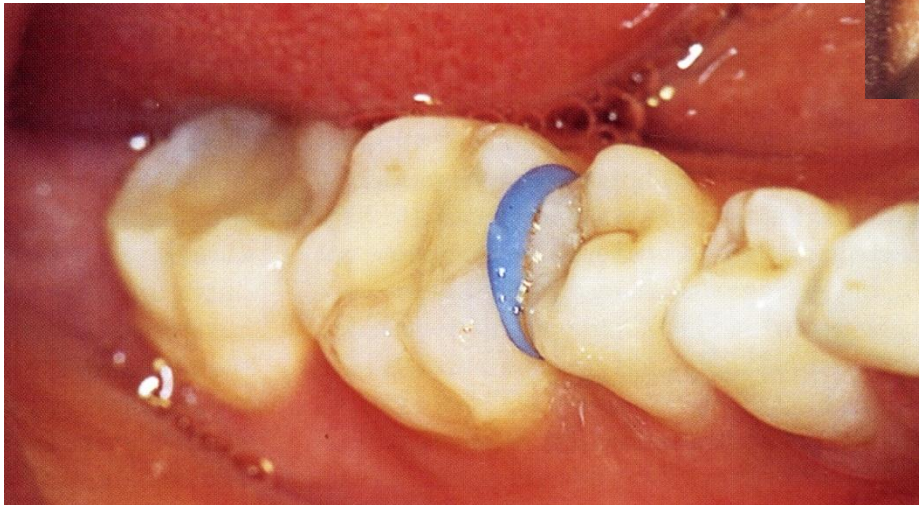
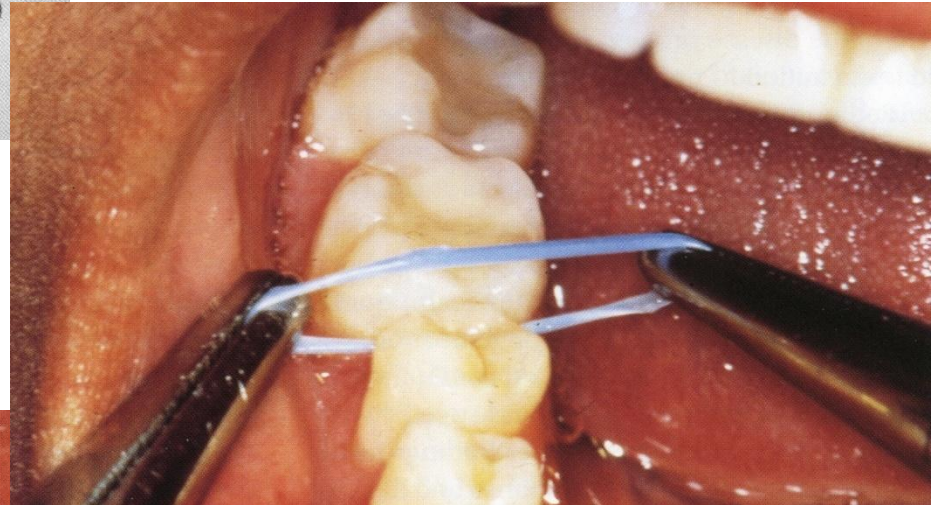
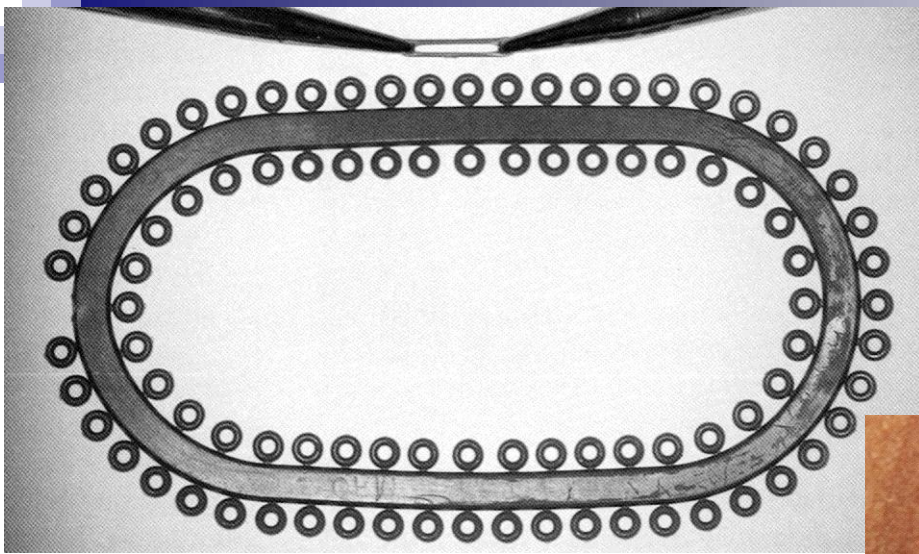
Temporary tooth separation

Placement of an orthodontic separator to move the teeth apart – direct visual access to a surface for diagnosis (for 3-4 days)

advantage:

- the avoidance of exposure to ionizing radiation

- the ability to detect whether the surface is cavitated



Diagnostic methods based on applied physical properties

An overview of advanced caries diagnostic methods related to the applied physical principles

Physical principle	Application in caries diagnosis
X-ray	Digital image enhancement Digital subtraction radiography Tuned aperture computed tomography
Visible light	Optical caries monitor (OCM) Quantitative fibre-optic transillumination (QOTI, FOTI)) Quantitative light-induced fluorescence (QLF)
Laser light	Laser-fluorescence measurement (Diagnodent)
Electrical current	Electrical conductance measurement (ECM) Electrical impedance measurement
Ultrasound	Ultrasonic caries detector

Coronal caries

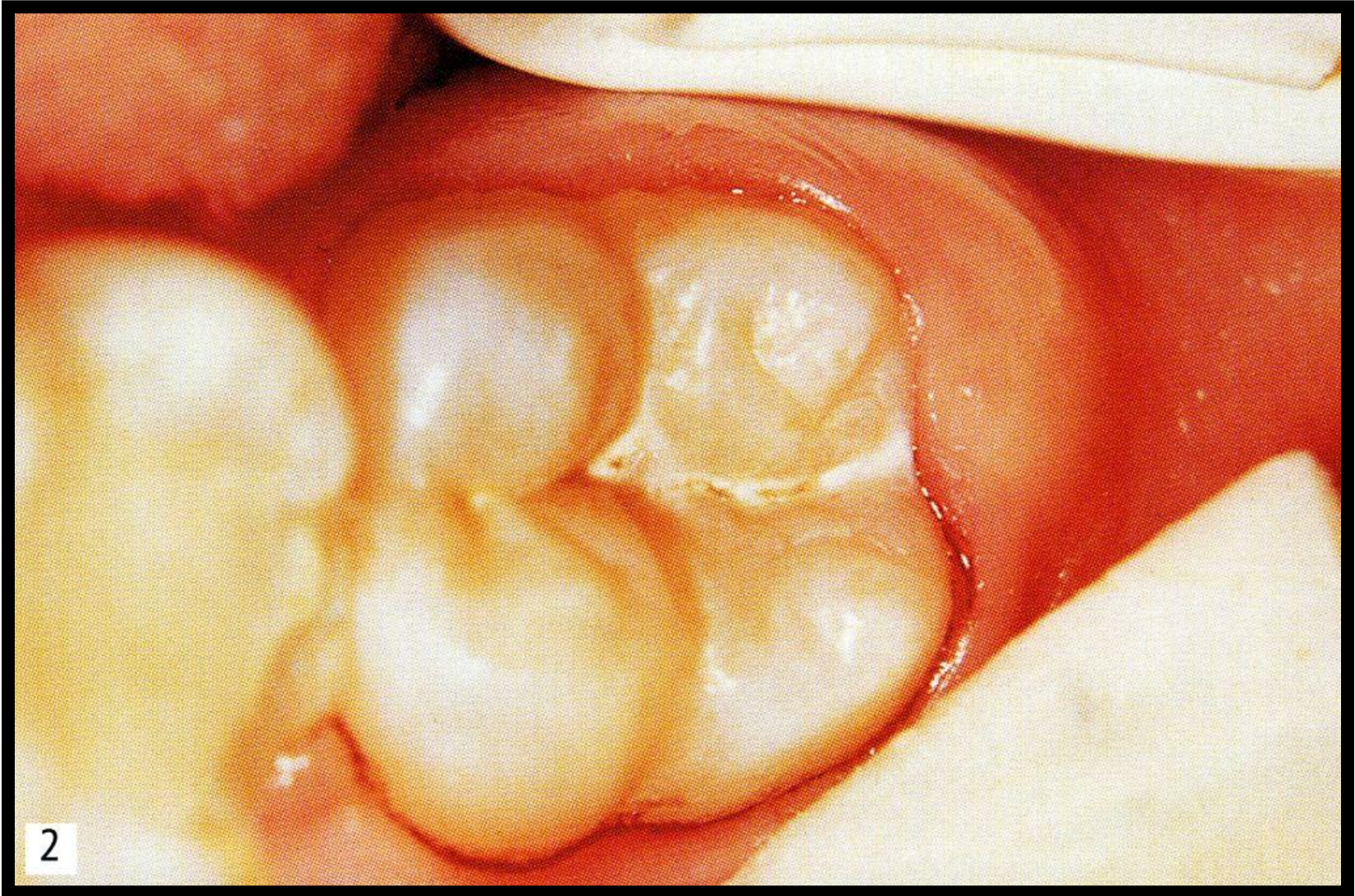
Diagnosis

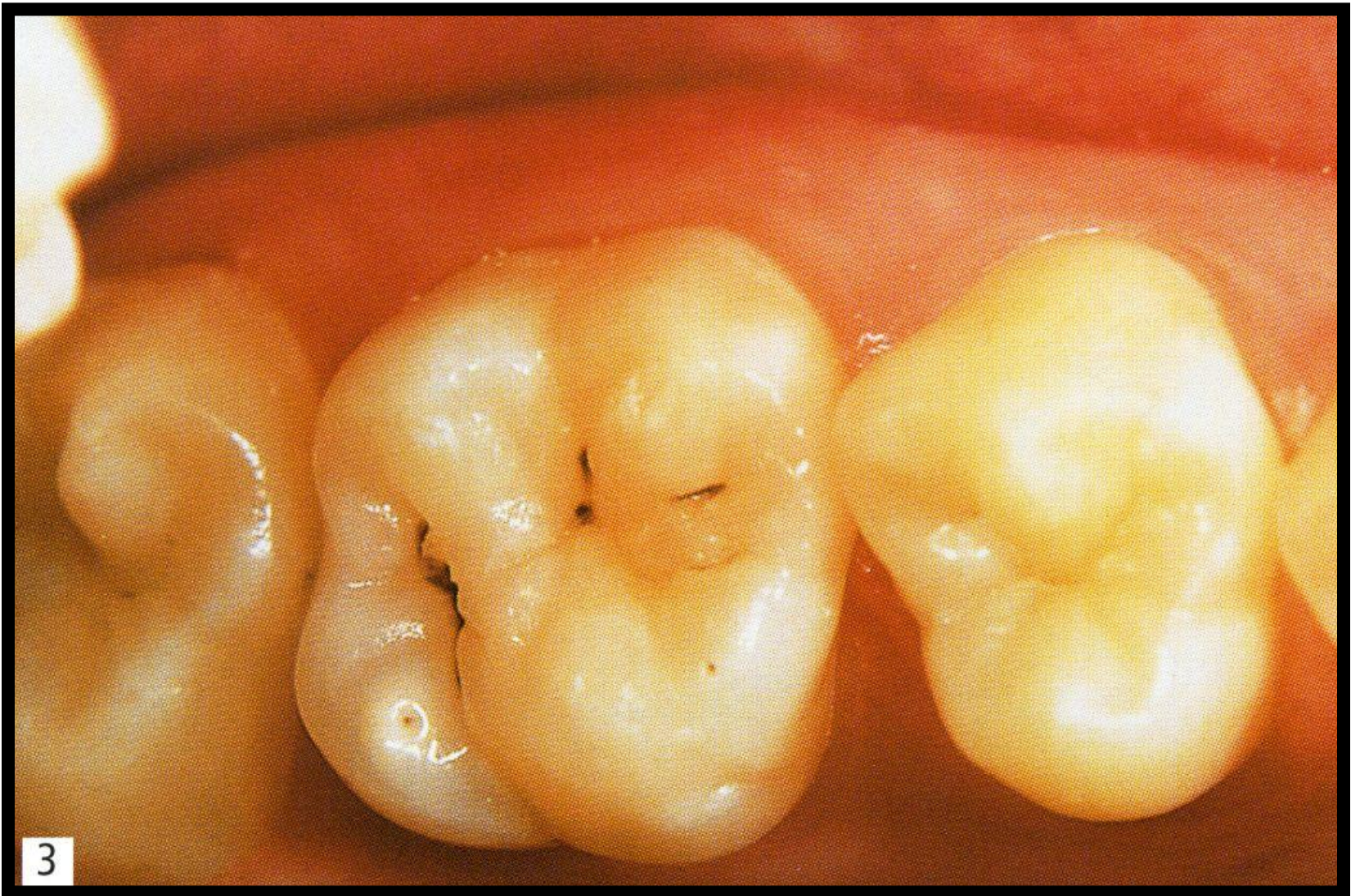
Visual examination, x-ray examination, FOTI, Diagnodent (laser)

On following pictures you can observe the changes in caries development, white spot in the fissure (2) dark line in the fissure system (3,4), development of cavitation, from hardly visible (5), to medium and extensive (6, 7), to destructive (8). White discoloration approxiamally involving the marginal ridge is signaling caries pulp. proxima or pulpal involvement (bite-wing 2, slide No.32). Visible caries (3), extent of cavitation not very large, the X-ray (bite-wing) revealed caries pulp. prox. (4). Slide No 35 demonstrates caries development occlusially from intact surface to extensive cavitation.



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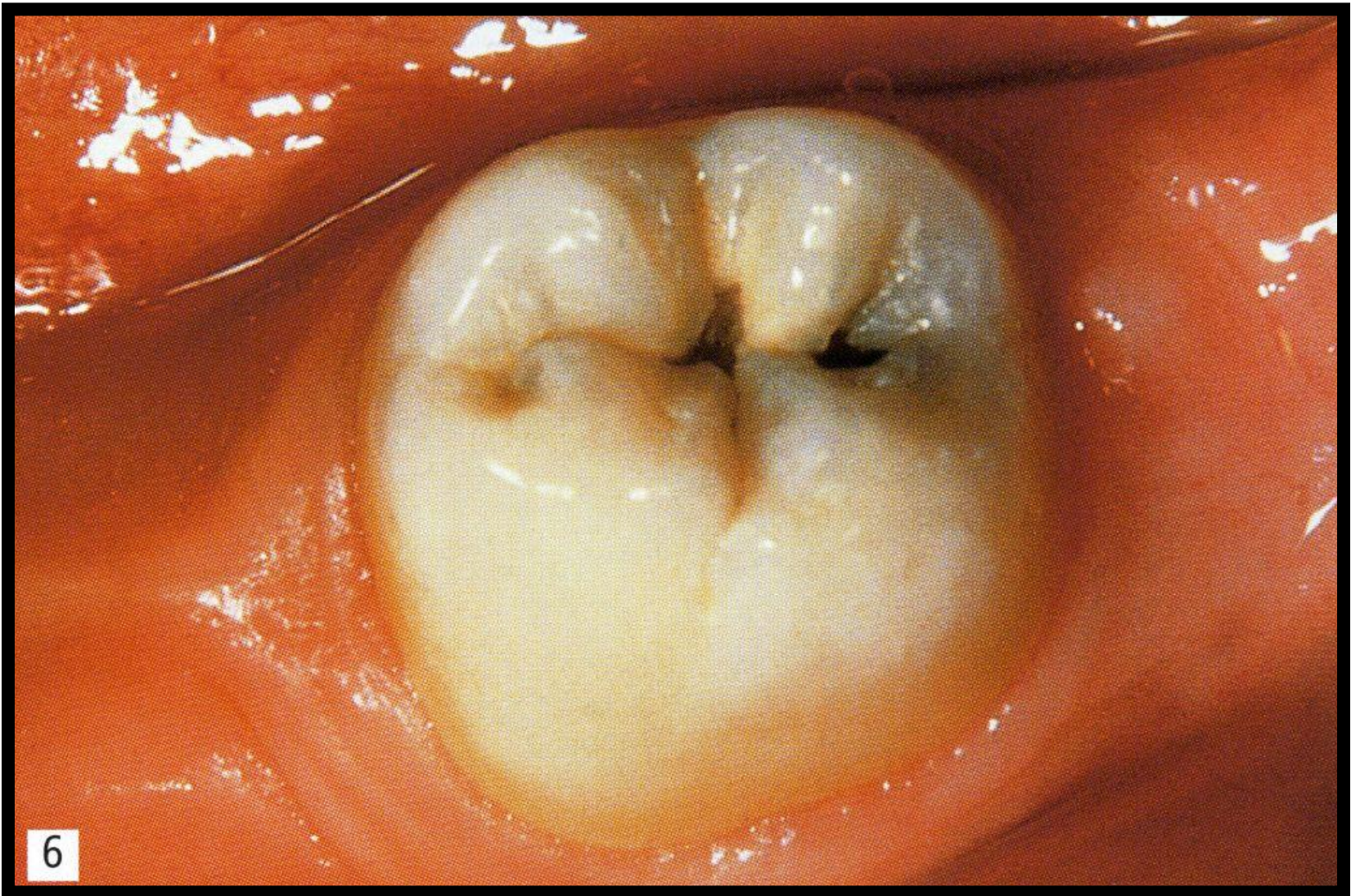




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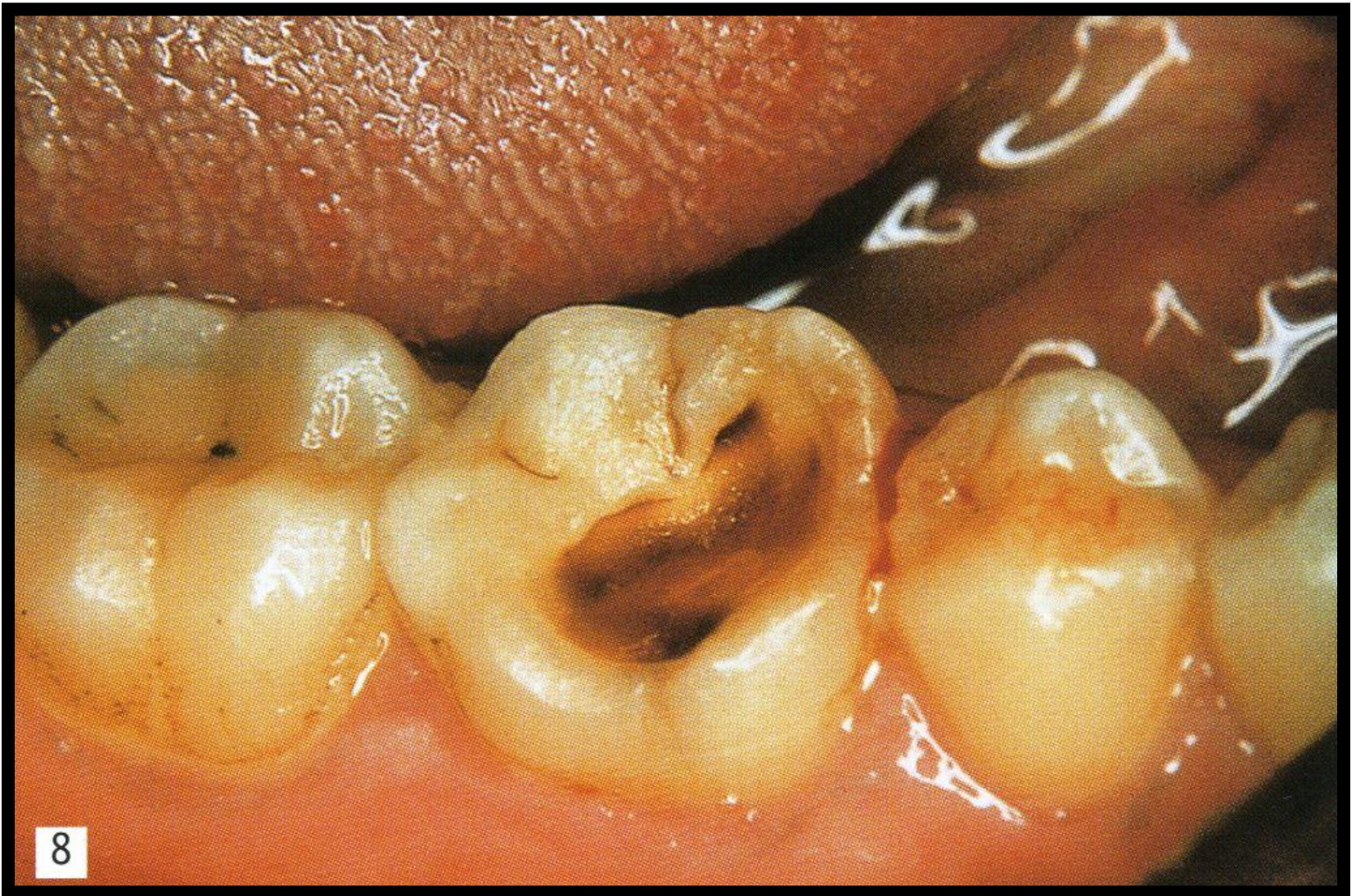


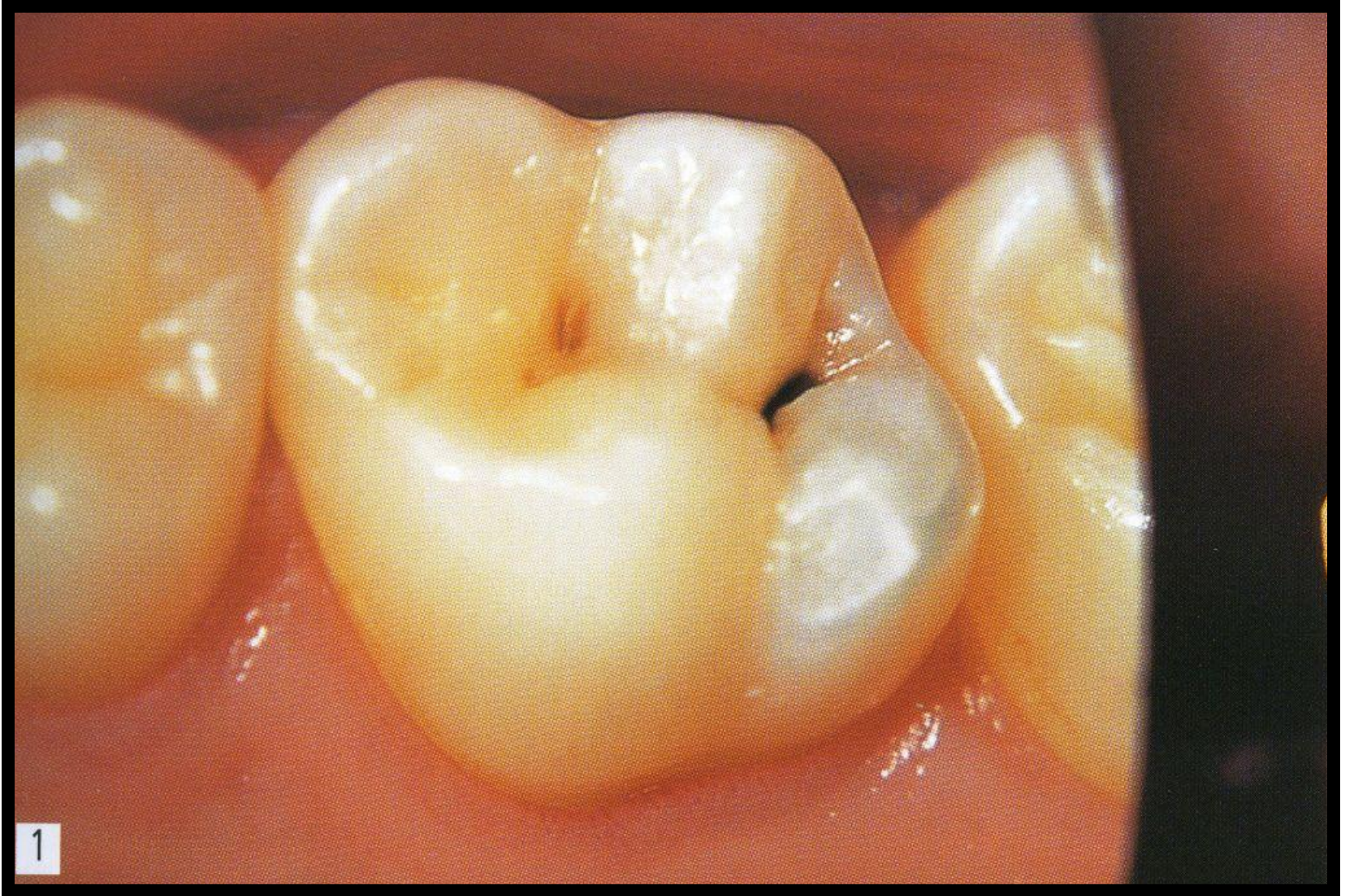
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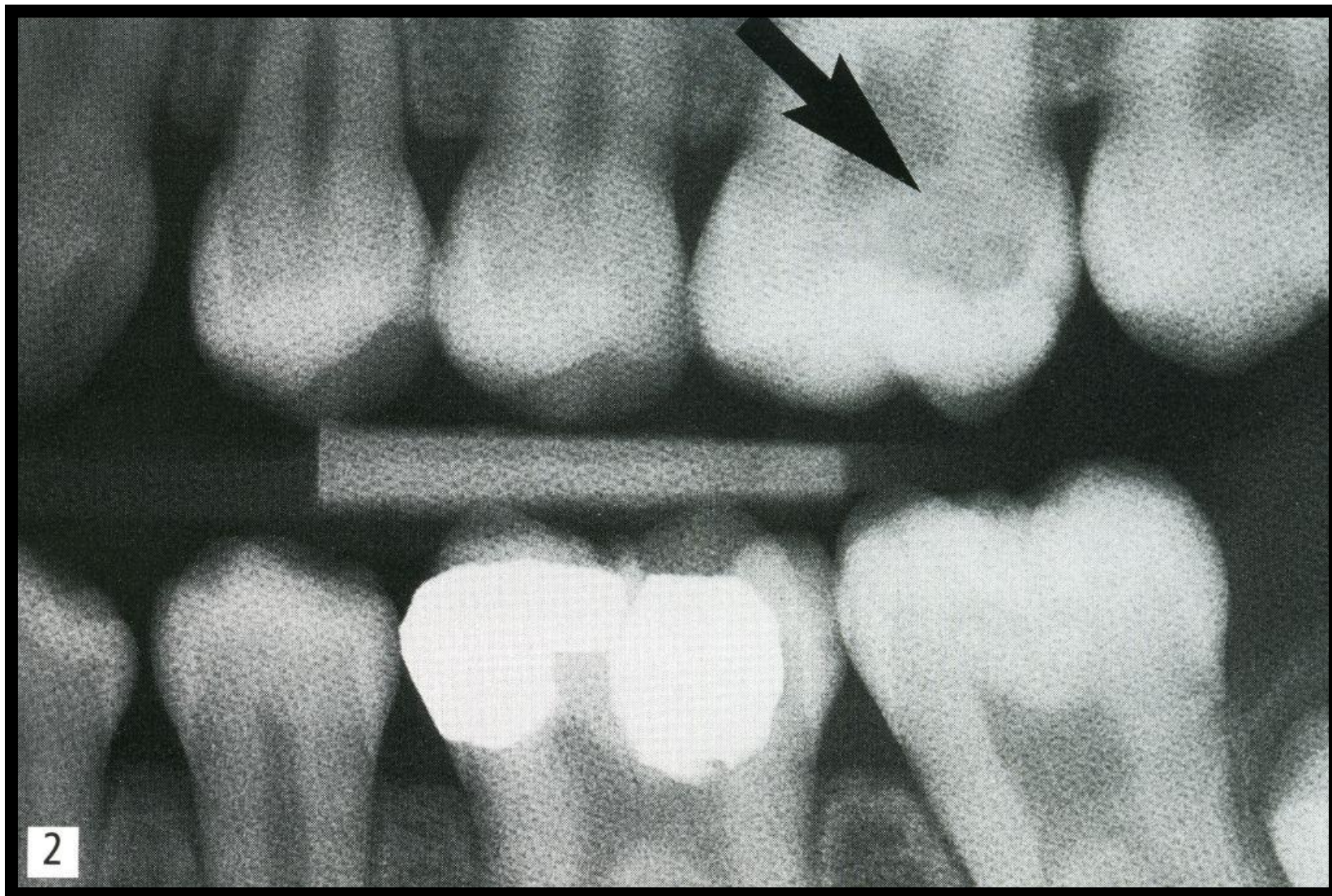


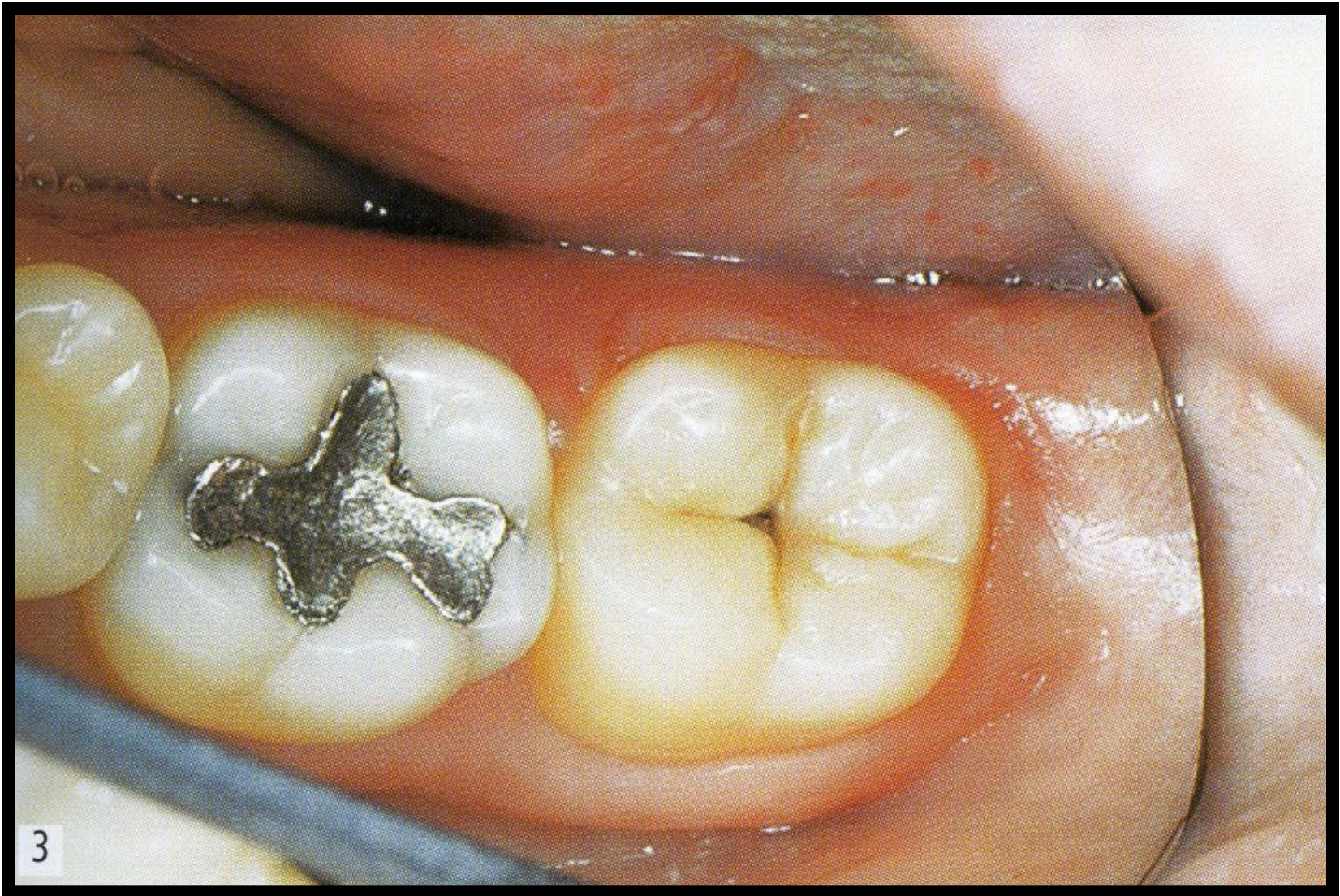


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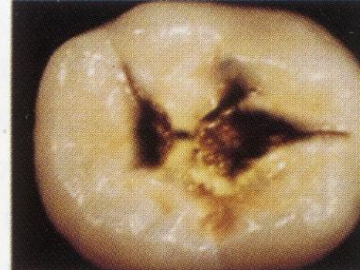
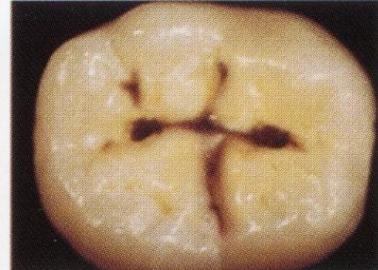
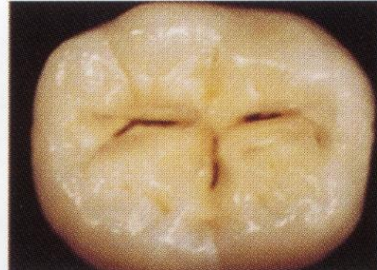
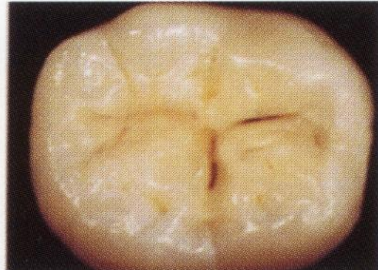
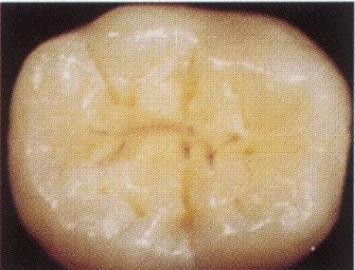
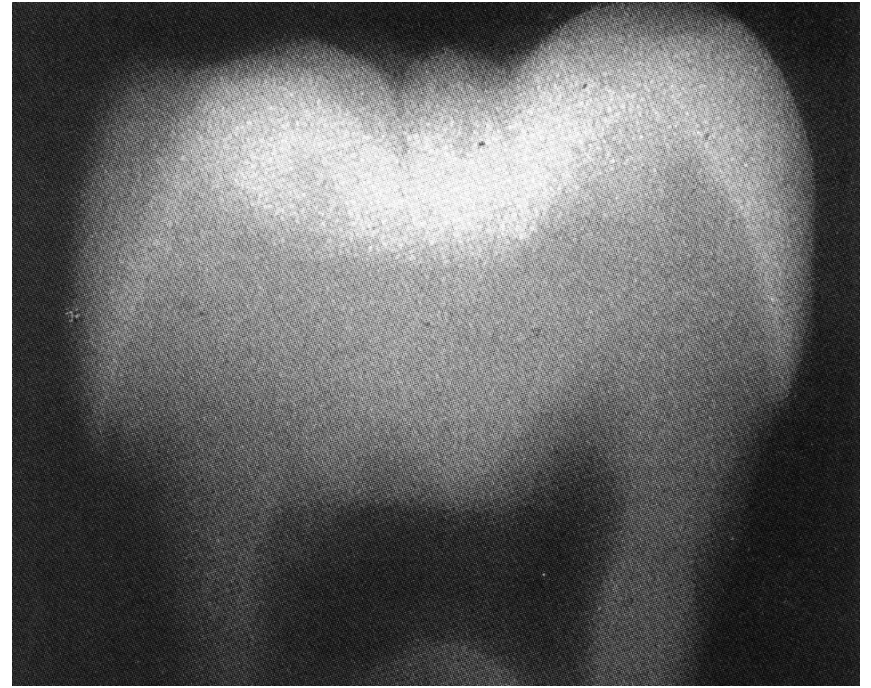






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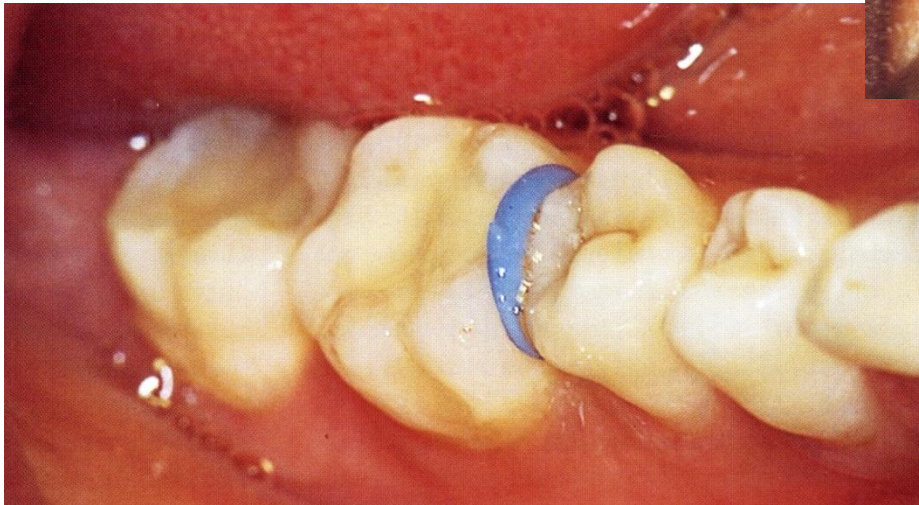
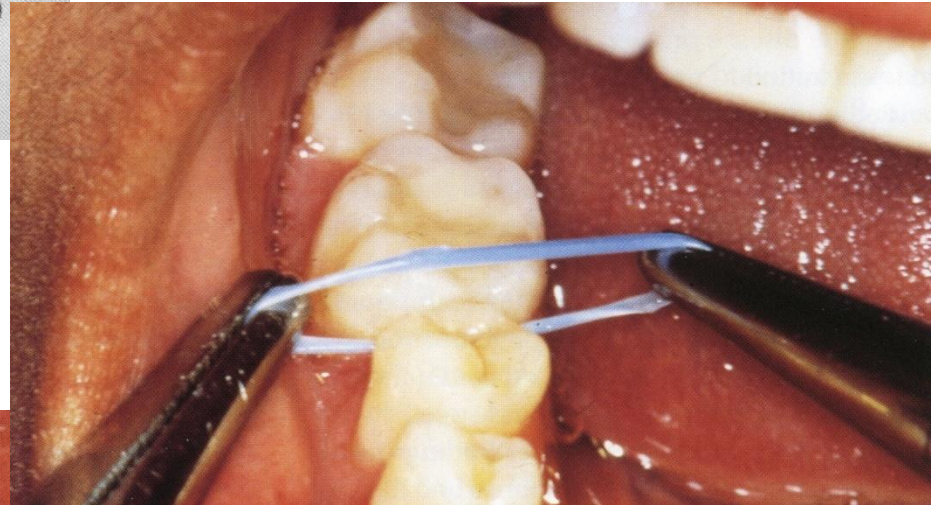
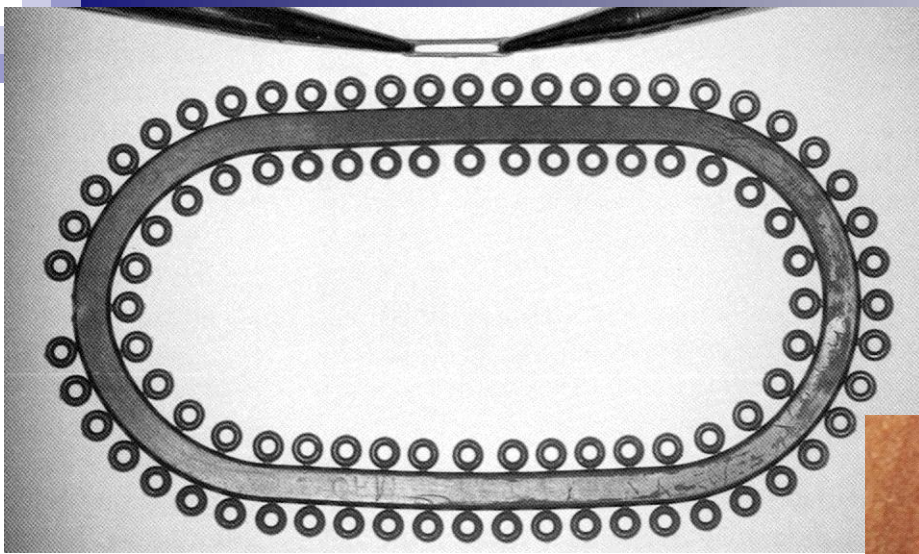






Approximal caries

Diagnosis – bite-wing, OPG, Temporary tooth separation, FOTI, Diagnodent (laser)





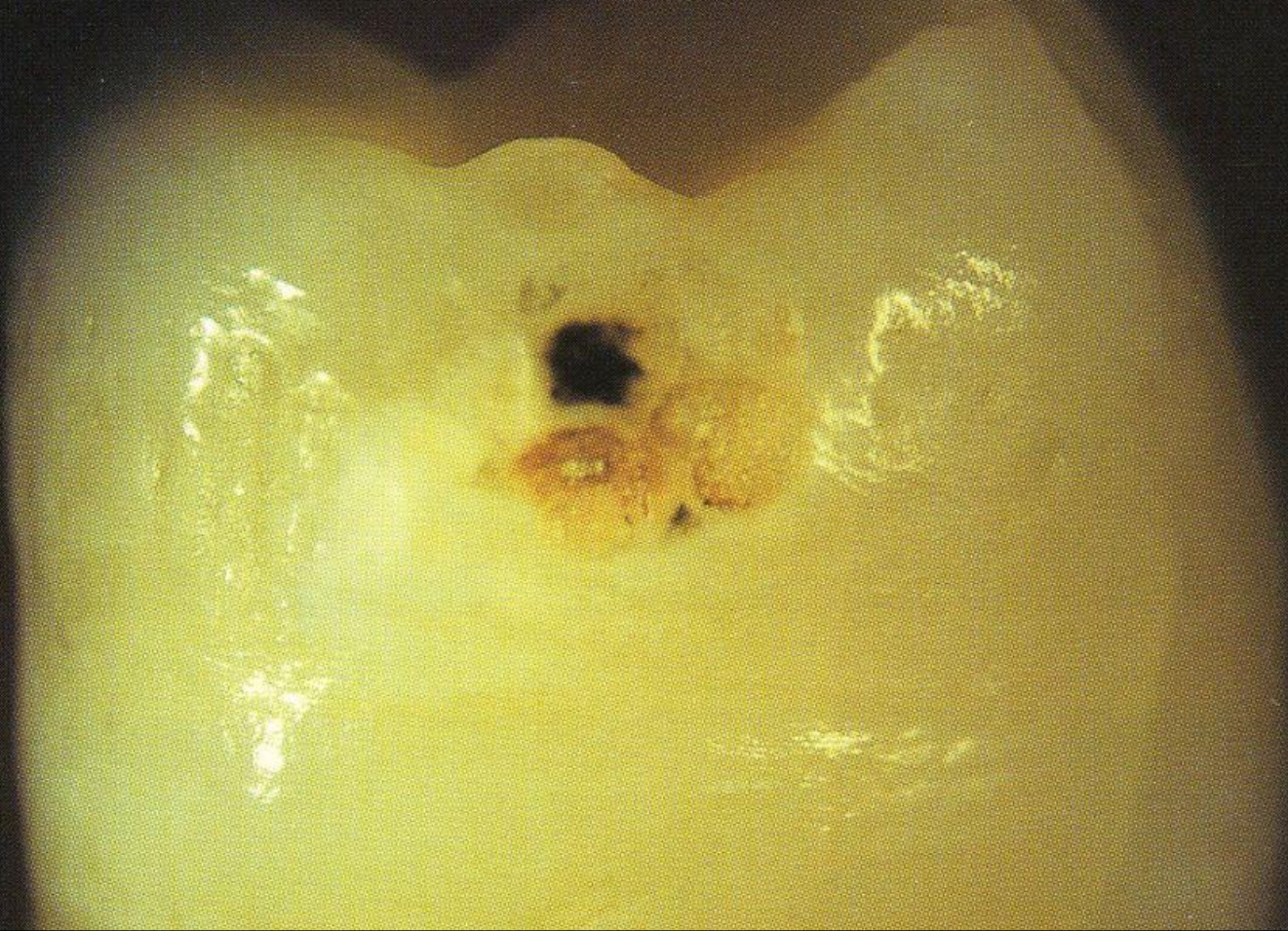
Approximal caries

Approximal caries can easily be diagnosed in case of missing neighbours.

Slide 42 demonstrates the radiolucency approximally reaching into the pulp vicinity on the bite-wing x-ray . The extent of caries is visible on the prepared teeth. Caries destructs the whole approximal wall and is in the close vicinity to the dental pulp.



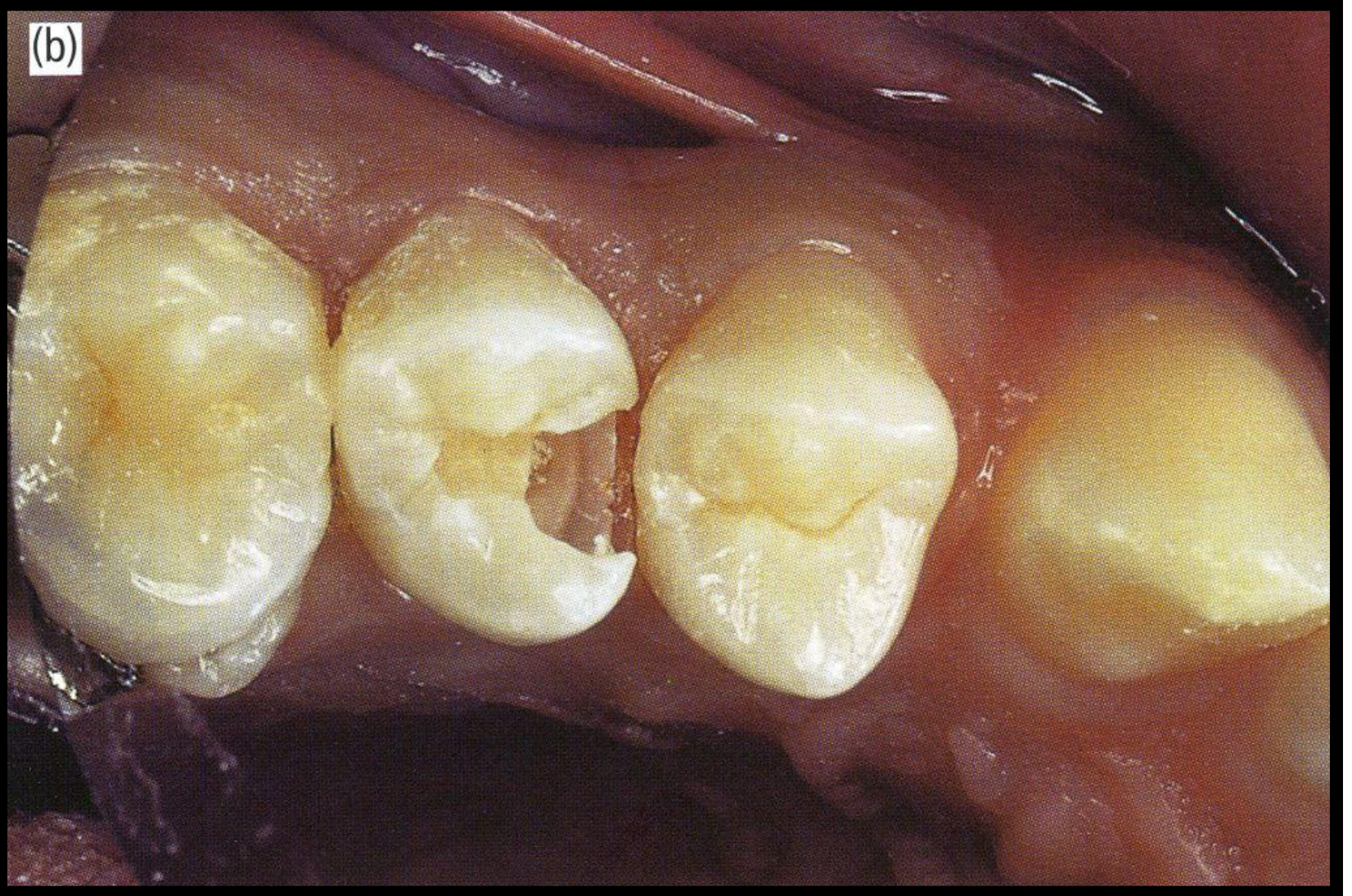
(b)



(a)



(b)

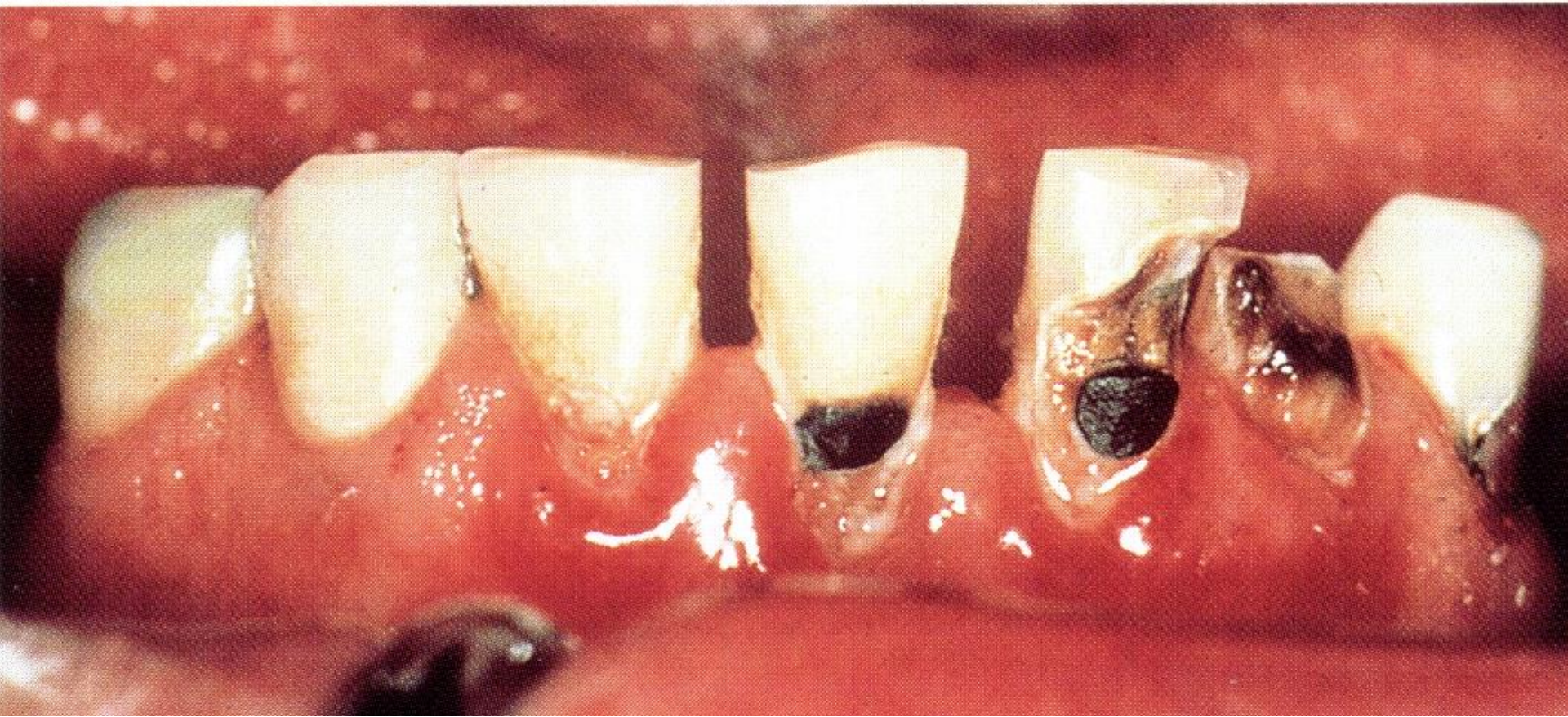




Root surface caries

Diagnosis

Shallow area, less than 2 mm deep
mostly non cavitated, ill-defined, softened
discolored lesion
destruction of cementum
penetrating dentine



Classification of root caries

Classification (Billings 1986)

Grade I (incipient)

Surface texture: soft, can be penetrated with a dental explorer

No surface defect

Pigmentation: variable, light tan to brown

Grade II (shallow)

Surface texture: soft, irregular, rough, can be penetrated with a dental explorer

Surface defect (<0.5 mm in depth)

Pigmentation: variable, light tan to brown

Grade III (cavitation)

Surface texture: soft, can be penetrated with a dental explorer

Penetrating lesion, cavitation present, (> 0.5 mm in depth)

Pigmentation: variable, light tan to brown

Grade IV (pulpal)

Deeply penetrating lesion with pulpal or root canal involvement

Pigmentation: variable, light tan to brown

Classification according to Nyvad and Fejerskov (1982, 1987)

Generally accepted at the present time

1. **Active root surface lesion**

Any area that is well defined and shows a yellowish or light brown discoloration. The lesion is most likely covered by visible plaque and/or presents a softening or leathery consistency on probing with moderate pressure.

2. **Inactive (arrested) root surface lesion**

Any root surface area that shows a well defined, dark brown or black discoloration. The surface of the lesion is smooth and shiny and appears hard on probing with moderate pressure.

Diagnosis and Characteristics of the root caries

Diagnosis

clinical examination, including gentle probing

primary caries

secondary caries

cementum

dentine

soft

leathery

hard

yellow, light brown, dark brown black

differentiation between active and inactive caries

both active and inactive may exhibit cavitation

tendency to spread circularly (Sharpey's fibres)

Histopathological features – very similar to caries in enamel and dentine

demineralization, remineralization, hypermineralized strip

Treatment of the root caries – no preparation. The lesion is circular – danger of the tooth fracture. The approach is prophylactic

The aim is to change the acute caries to arrested one (slide 49)

1. Motivation
2. Instruction and training of proper oral hygiene
3. Improvement of the oral hygiene
4. Change of dietary habits (nutrition)
5. Fluoridation (tooth paste, rinses, gels and mainly - varnishes)

Root caries, detection of the dental plaque both on the tooth and gingiva (1,2).

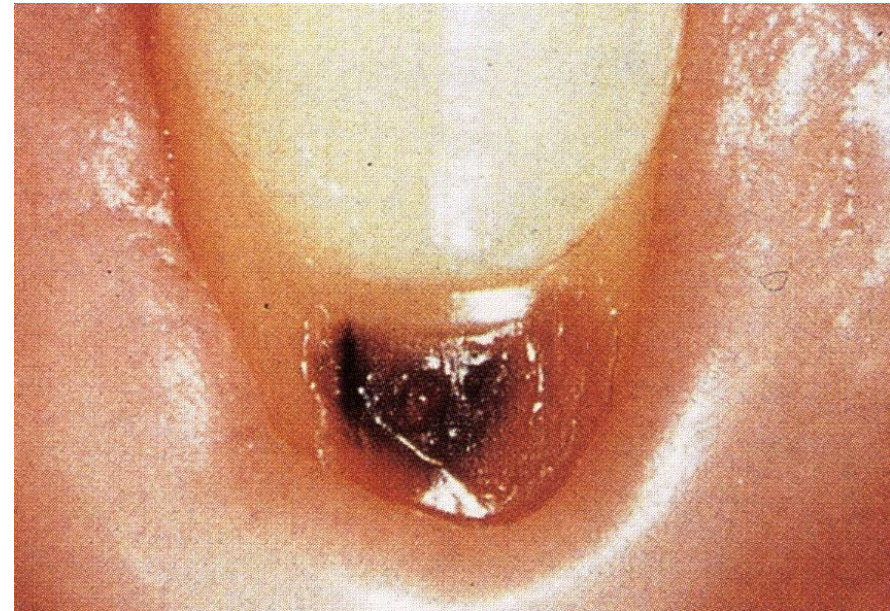
Shallow cavitation approximally (3)

Lesion is changing its appearance and colour (brown-to black), gingiva without inflammation, the lesion is glossy (4)

Lesion almost heaaled, the surface is hard, glossy and discolored to brown-black, gingiva without inflammation (5, 6)

Successive changes on the root surface in case of root caries treatment localized on an incisor (7-10) and in the premolar region (1-4). Notice the change of gingiva.

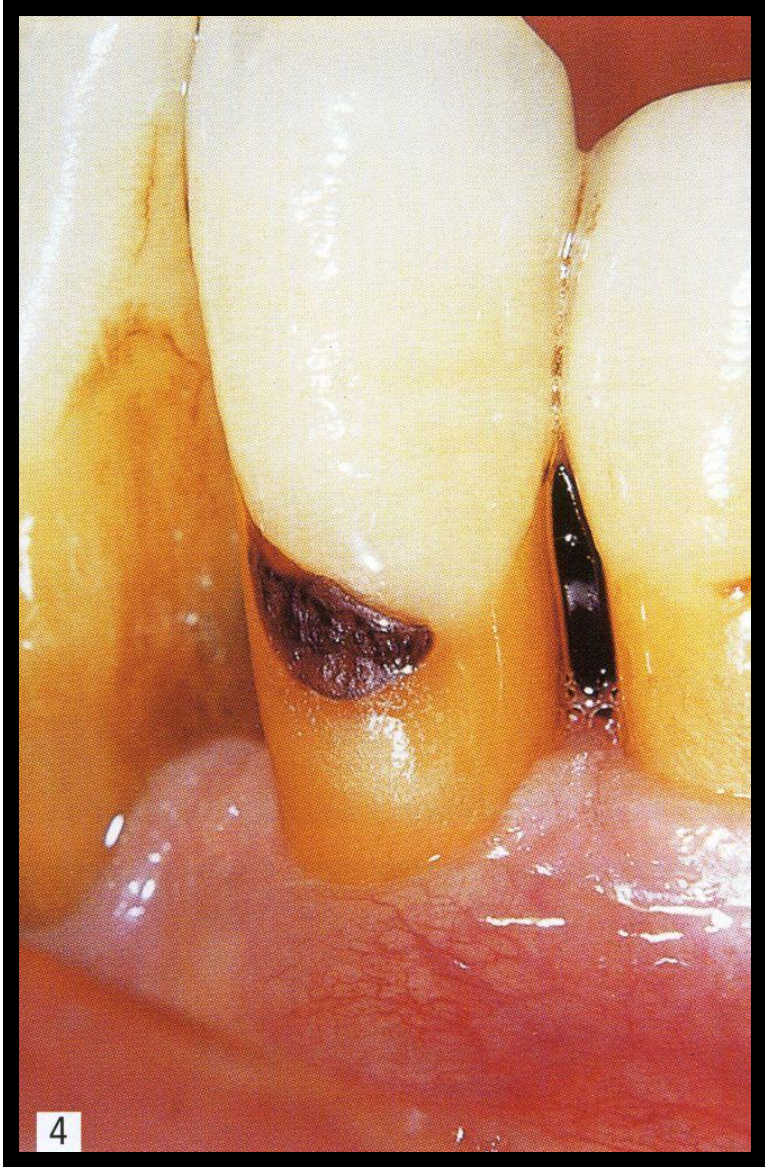
Oral hrealth state before the treatment and after the prophylactic approach – calculus removal, proper hygiene, changes of gingival inflammation and changes of root surface (5,6) _ the same patient.



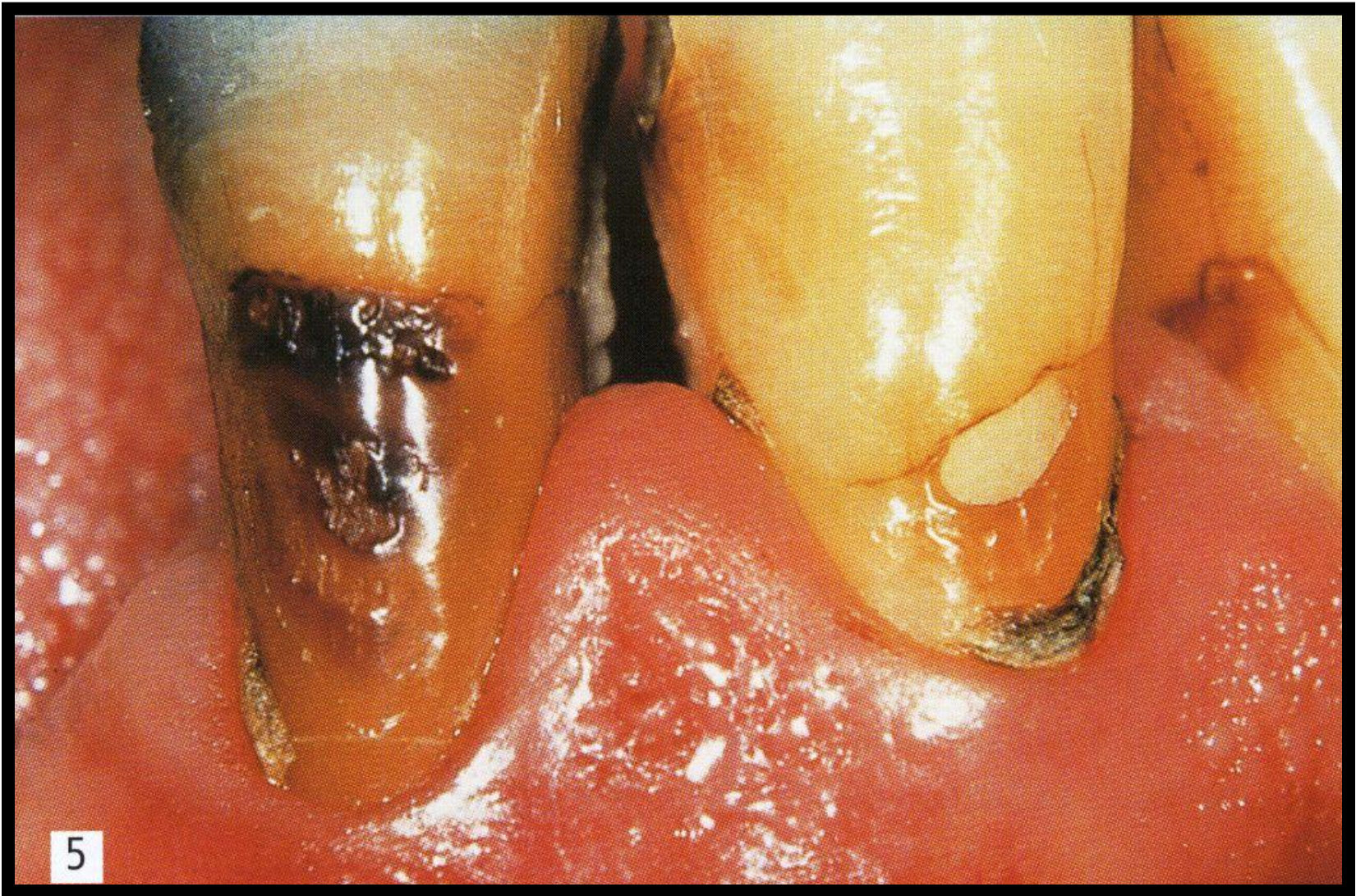


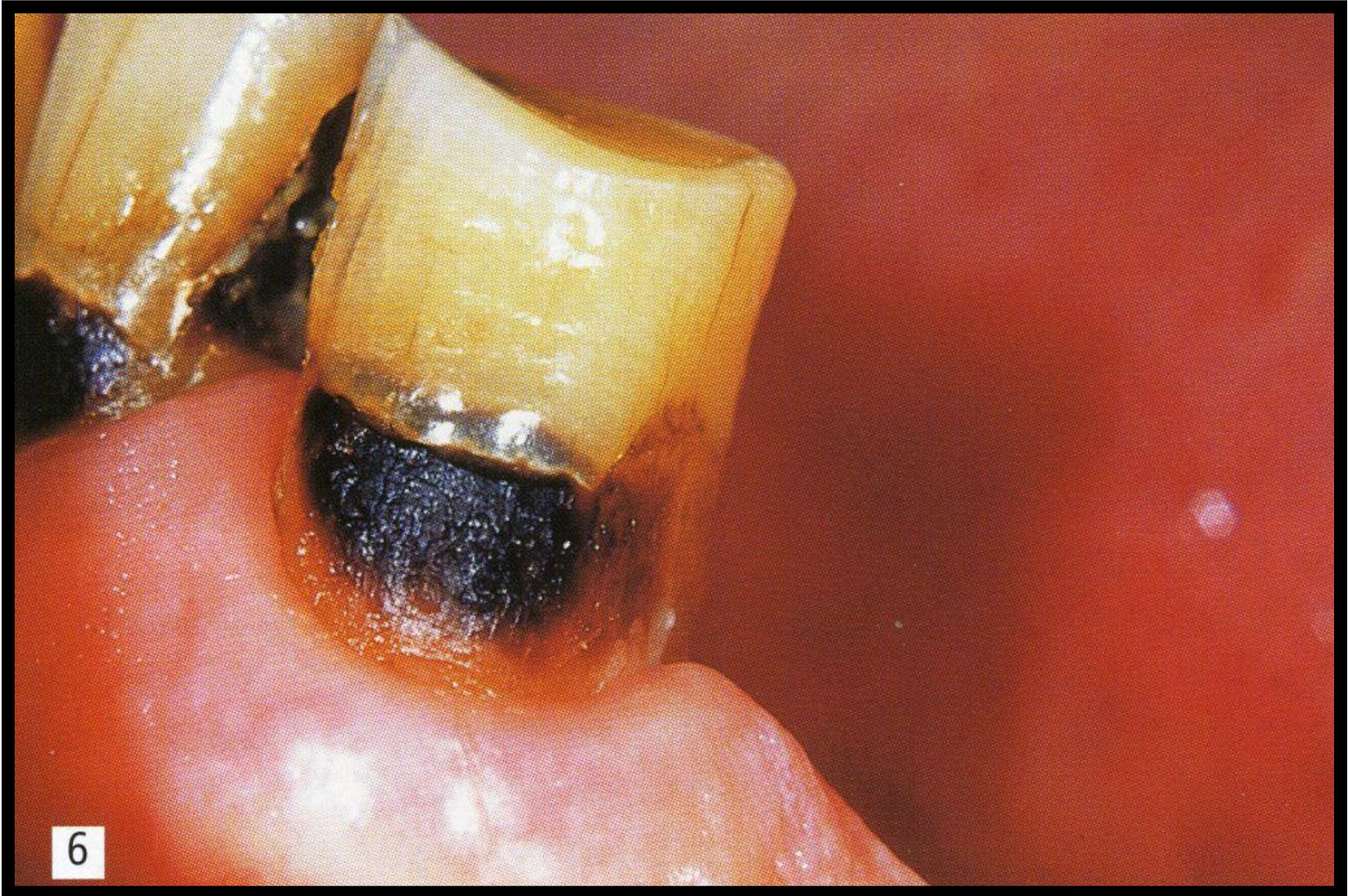






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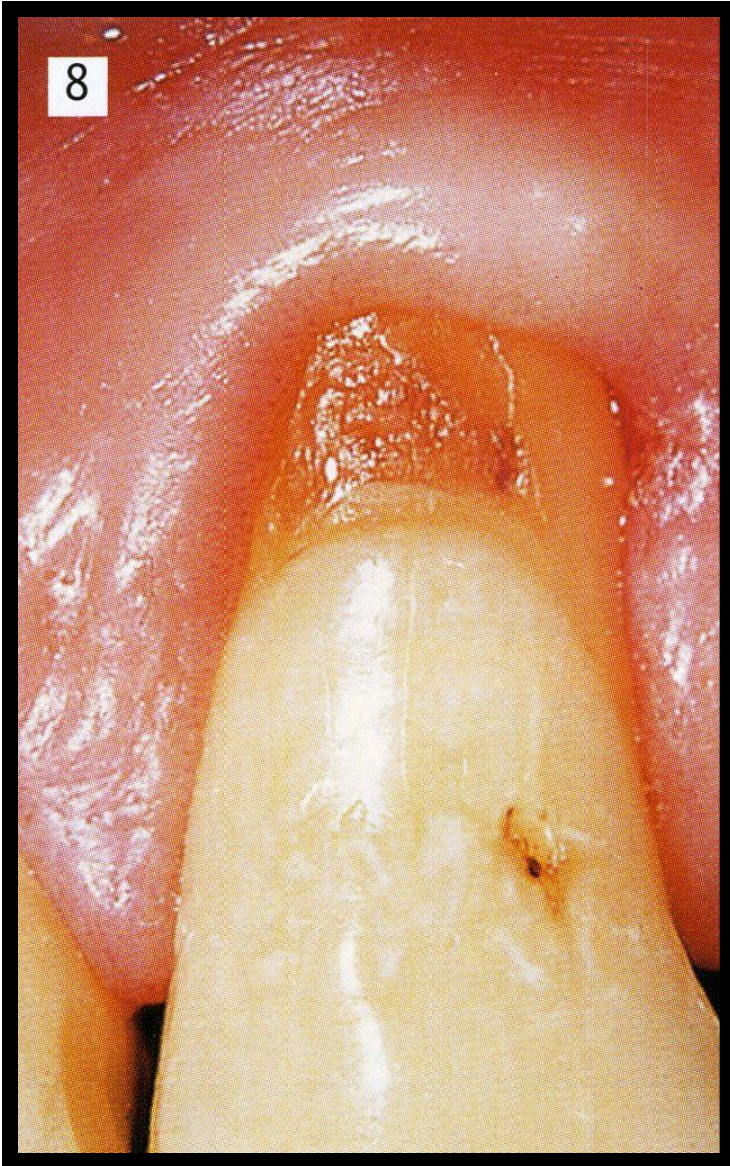


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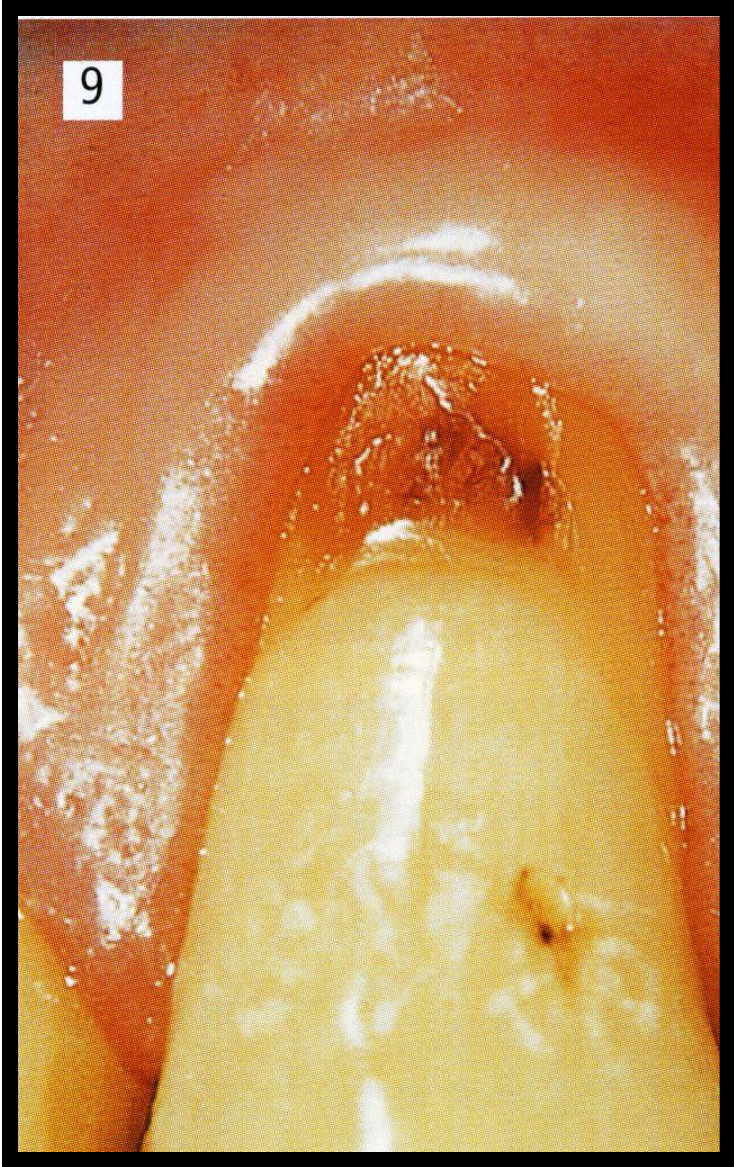
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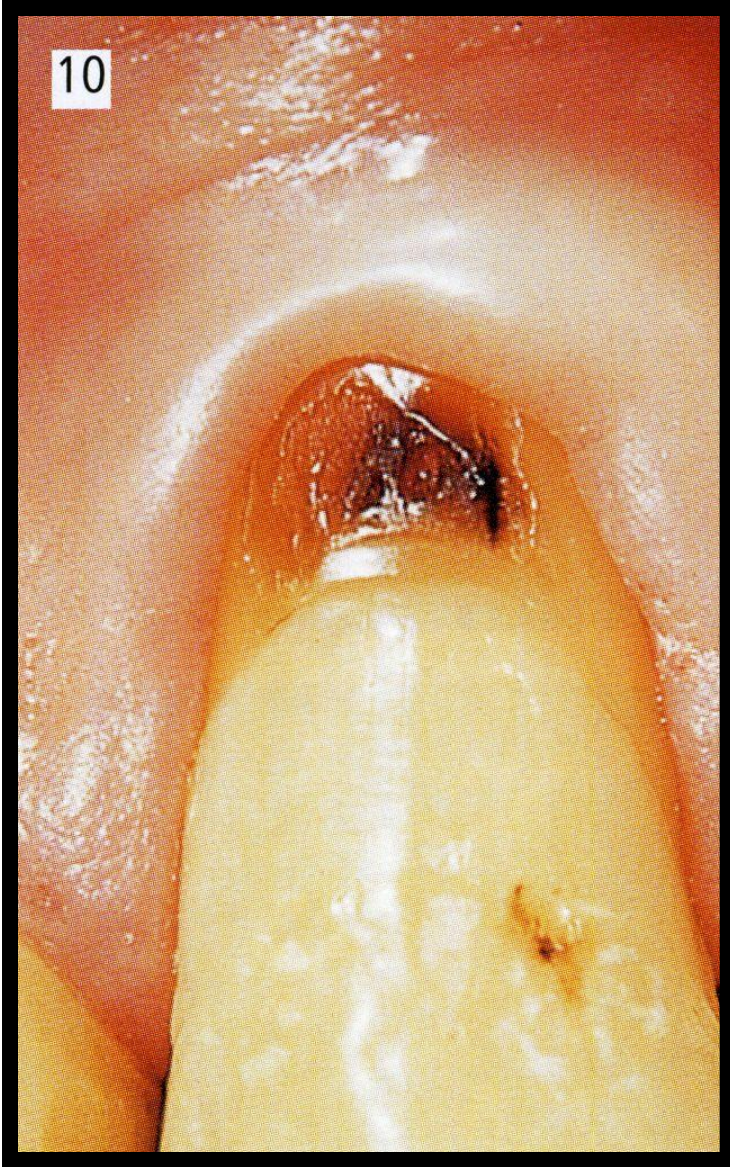
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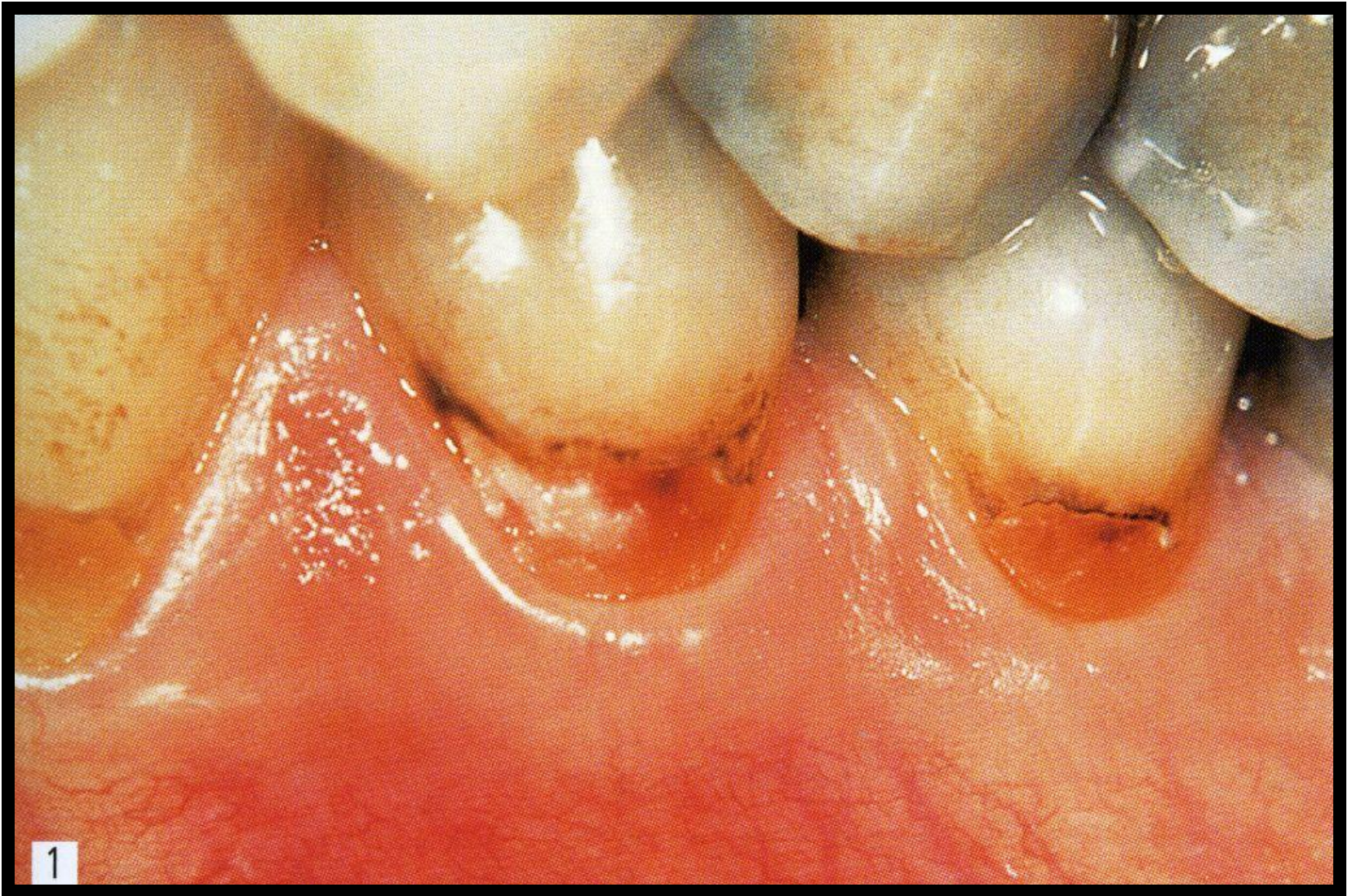


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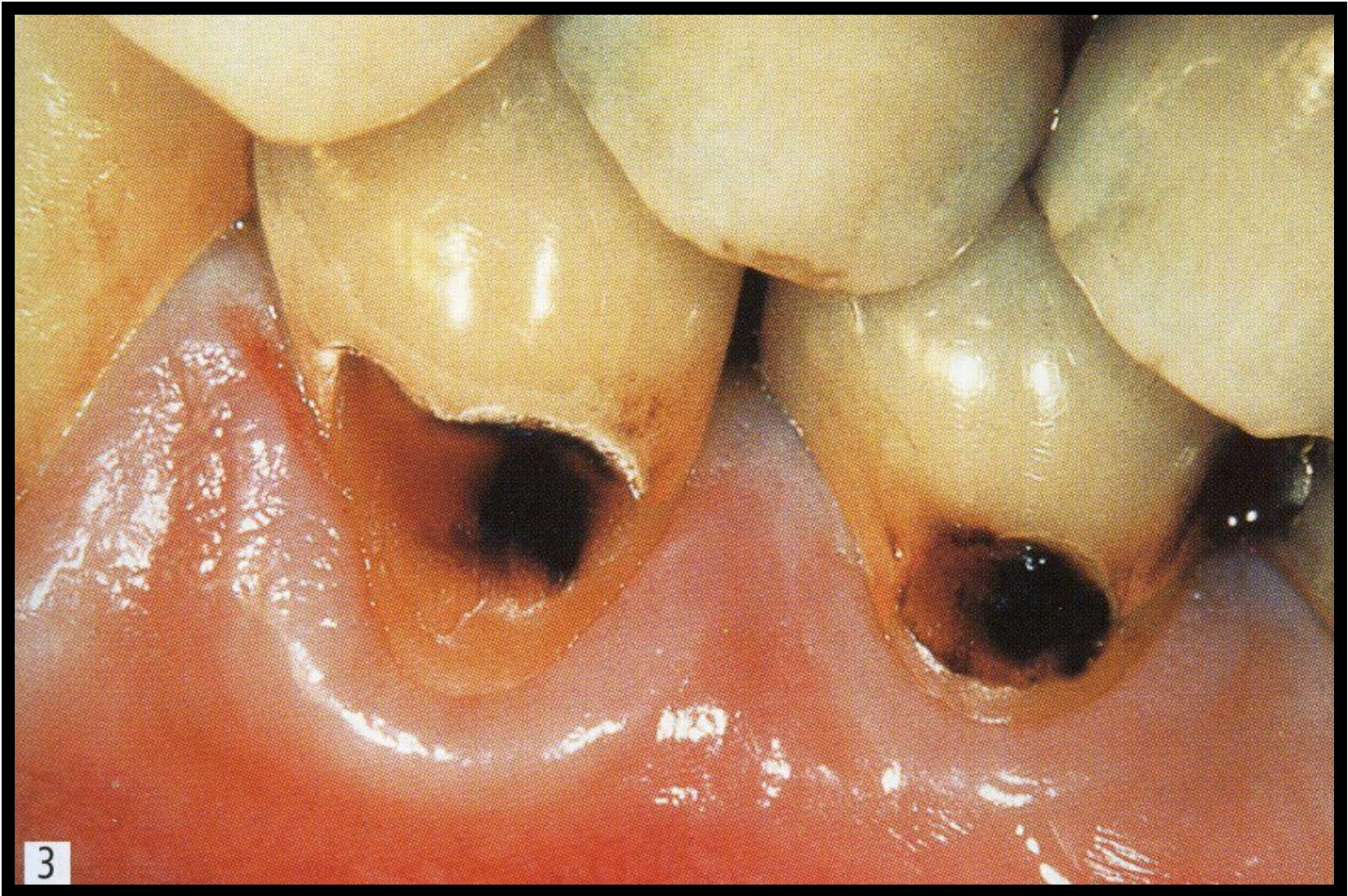


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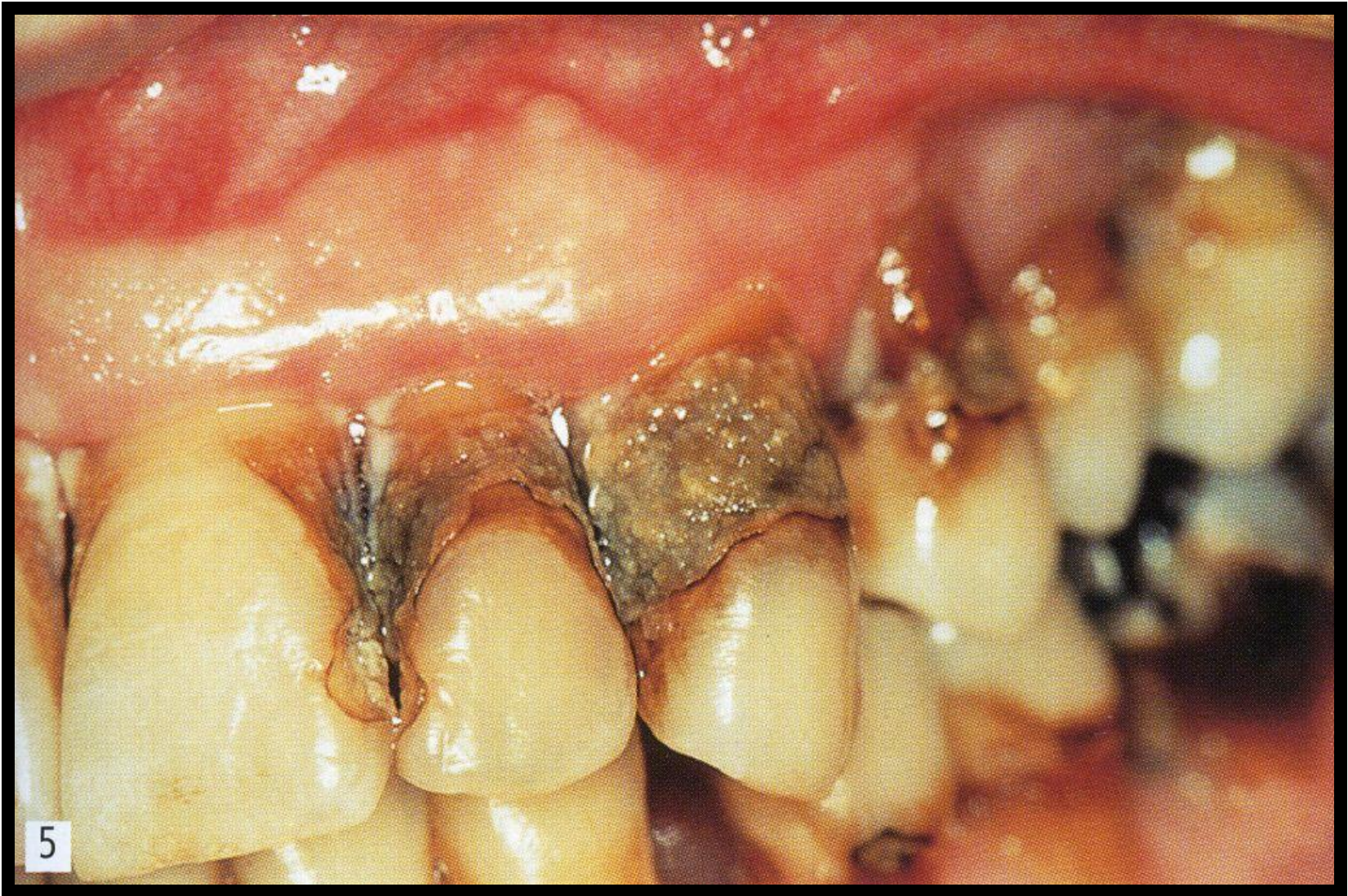






3





5



6

Secondary caries

Sequence of changes along the cervical margin of the filling – secondary caries development



Non carious lesions

- Fluorosis (see slides 69 – 74, severity of a different degree)
- Tetracyclines
- Amelogenesis imperfecta
- Dentinogenesis imperfecta
- Erosions
 - erosion – dissolution of enamel by chemical process**
 - idiopathic erosion – composition of saliva (citric acid)
 - dietetic erosion – citrus fruits, coca – cola
 - Professional erosion – exposition to acids

Non carious lesions

Traumatic defects of enamel

- A. **physiologic attrition – consequence of natural tooth contacts**
- B. **pathologic attrition – intensification - bruxism, use of teeth as tools**
Exposure of the dental pulp – rarely (secondary dentin formation)
- C. **abrasion – pathologic loss of enamel (and dentin) as the consequence of physical force other than that of occlusion (mastication). Wedge defects, playing woodwinds instruments, tooth brushing, pipe smoking**

6



1



2



3



4



5



Tetracyclines



Tetracyclines



Tetracyclines

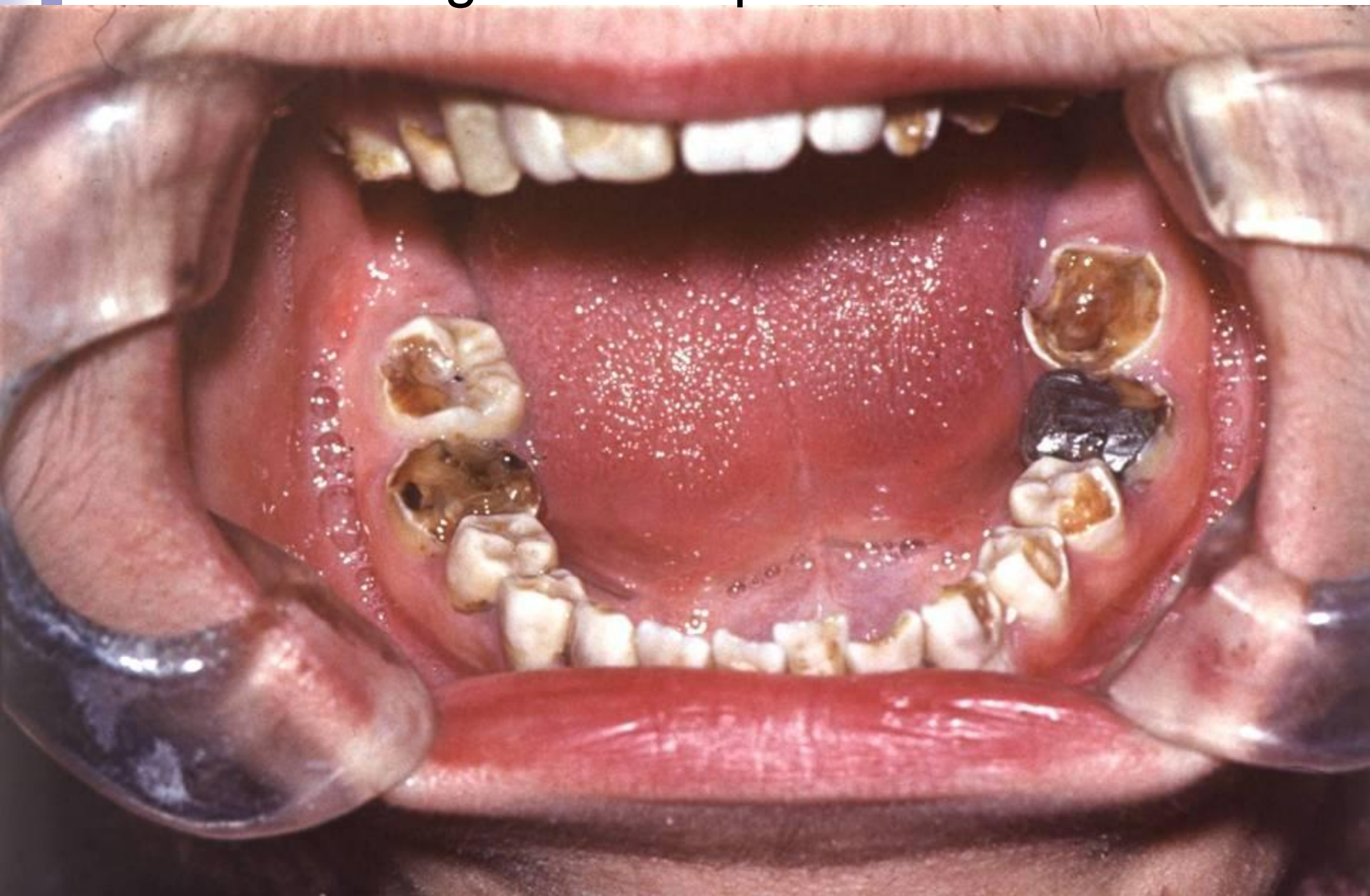
Discoloration of teeth - in dentine

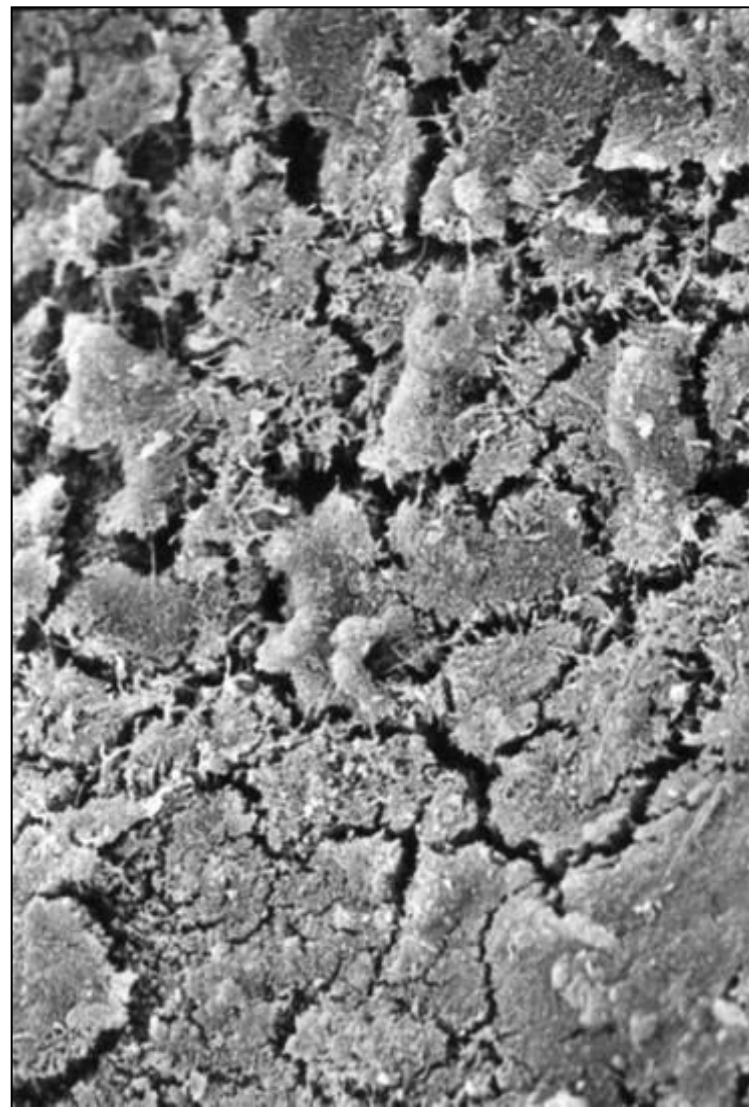


Amelogenesis imperfekta



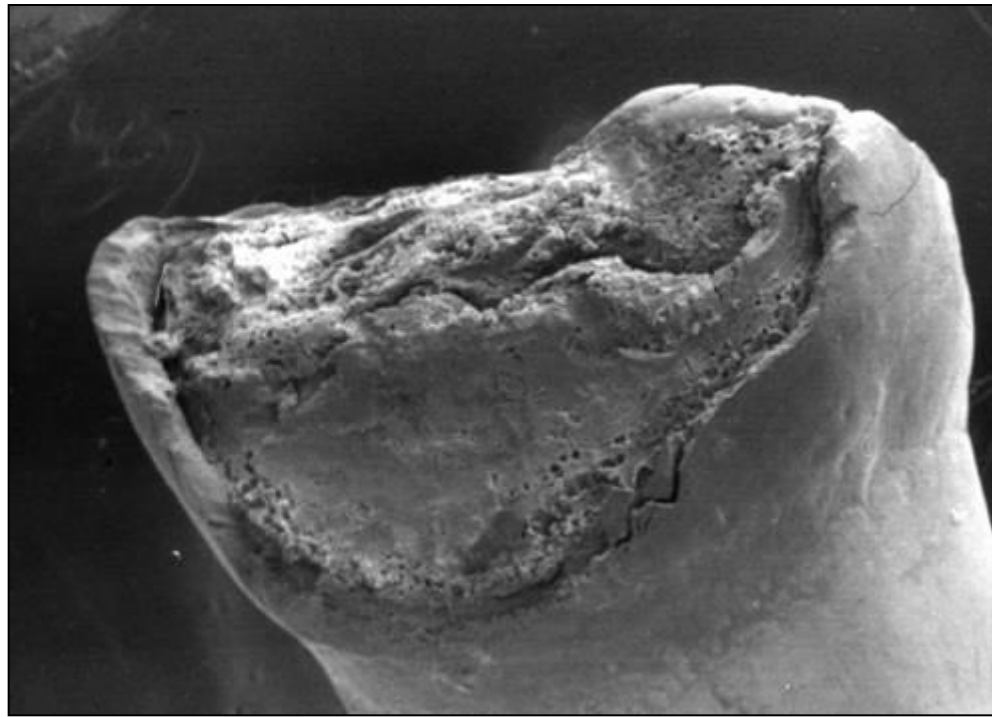
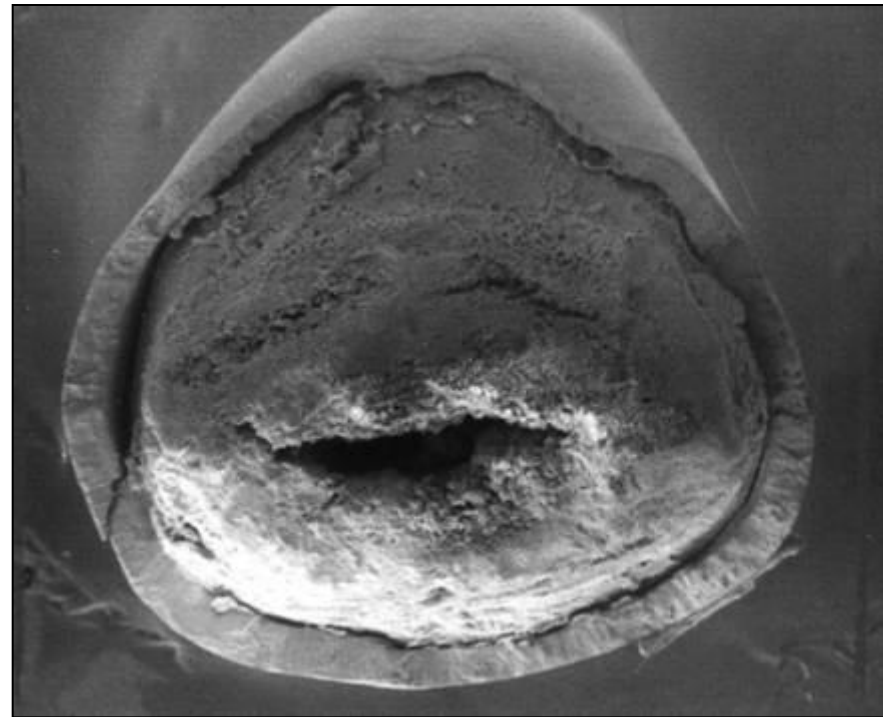
Amelogenesis imperfekta





After plaque removal –large erosions ,penetration into the enamel

Finding



Primary canine –erosive loss of enamel in the whole extent