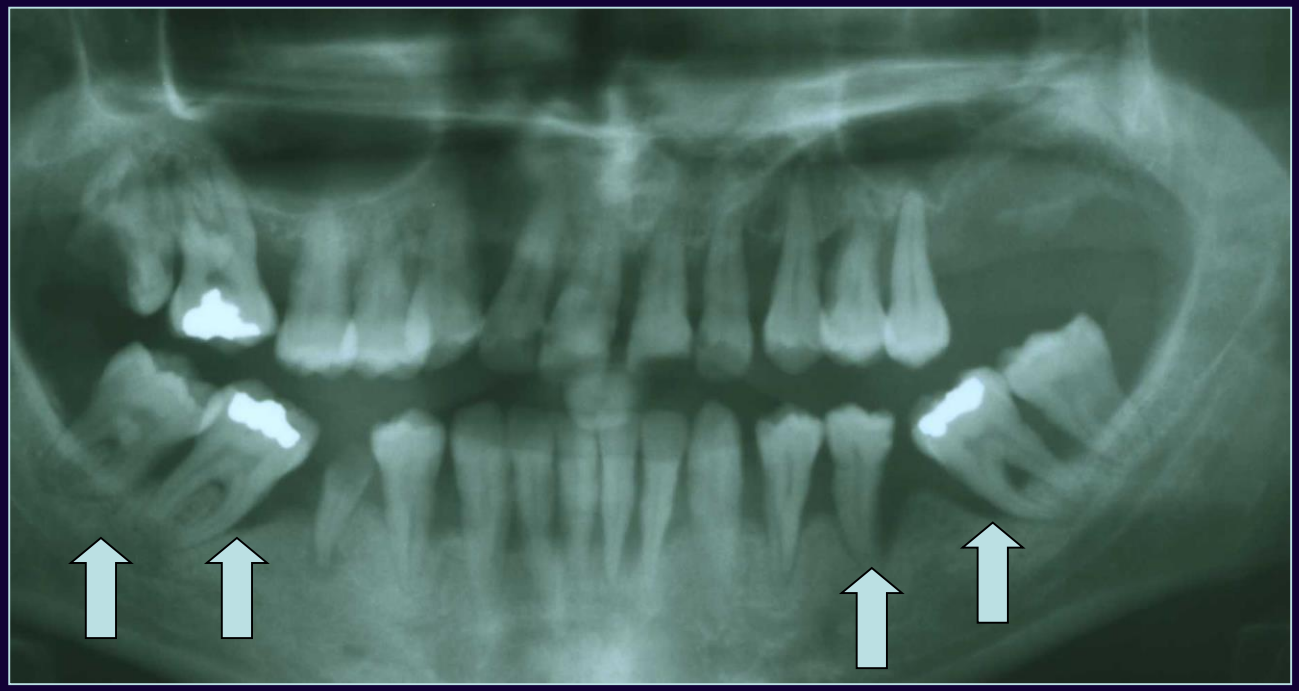
Endodontal - Periodontal Interrelationship



THE CAUSATIVE FACTORS ARE COMMON:

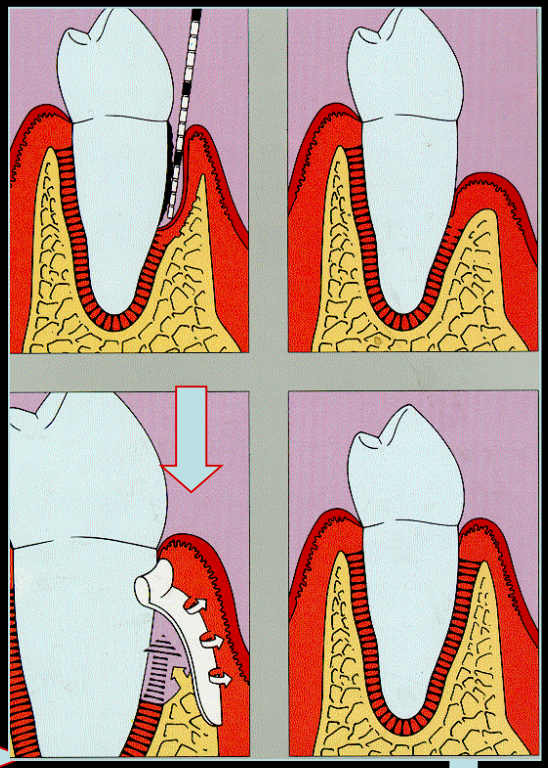
DENTAL BIOFILM

BOTH CAN DESTROY ATTACHMENT APPARATUS

BUT!!!!

periodontitis is resulting in irreversible attachment loss

only GTR or other regenerative techniques can succeed



endodontal infection related attachment and bone loss is reversible unless root canal therapy fails

Spontaneous healing after correct root canal obturation

In 1919 Turner and Drew were the first to describe the effect of periodontal disease on the pulp, ……..

DYSTROPHIC DEGENERATION,
FIBROSIS
CYSTIC DEGENERATION

Lang et al 1920

Chan LR, 1924

Curnock G.L. 1924

the term **PERIO-ENDO LESION** is used to describe lesions due to inflammatory products found in different degrees in both the periodontium and the pulpal tissues.

. **Pathway of communication between endodontal tissue and periodontal tissue**

Physiologic Pathways

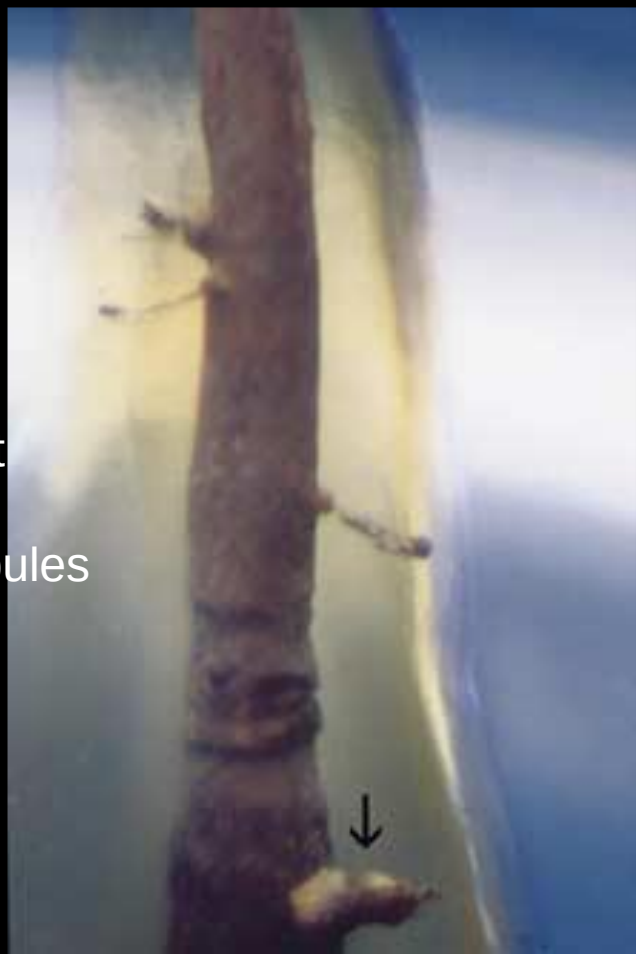
- Dentinal tubules
- Lateral and accessory canals
- Apical foramen
- Palato-gingival groove

Iatrogenic

- Perforation
- Root fracture during root canal therapy
- Exposure of dentinal tubules during root planning

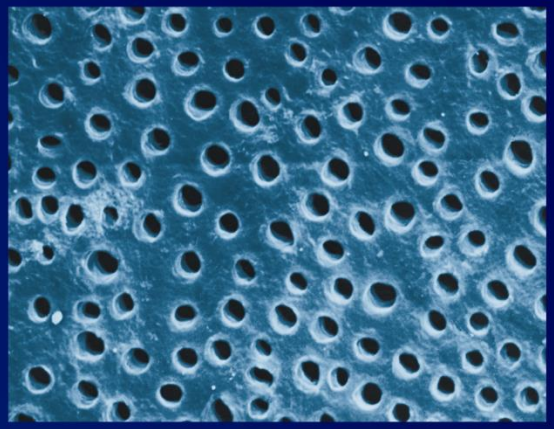
Pathological causes

- Perforations
- Vertical root fracture
- Loss of cementum

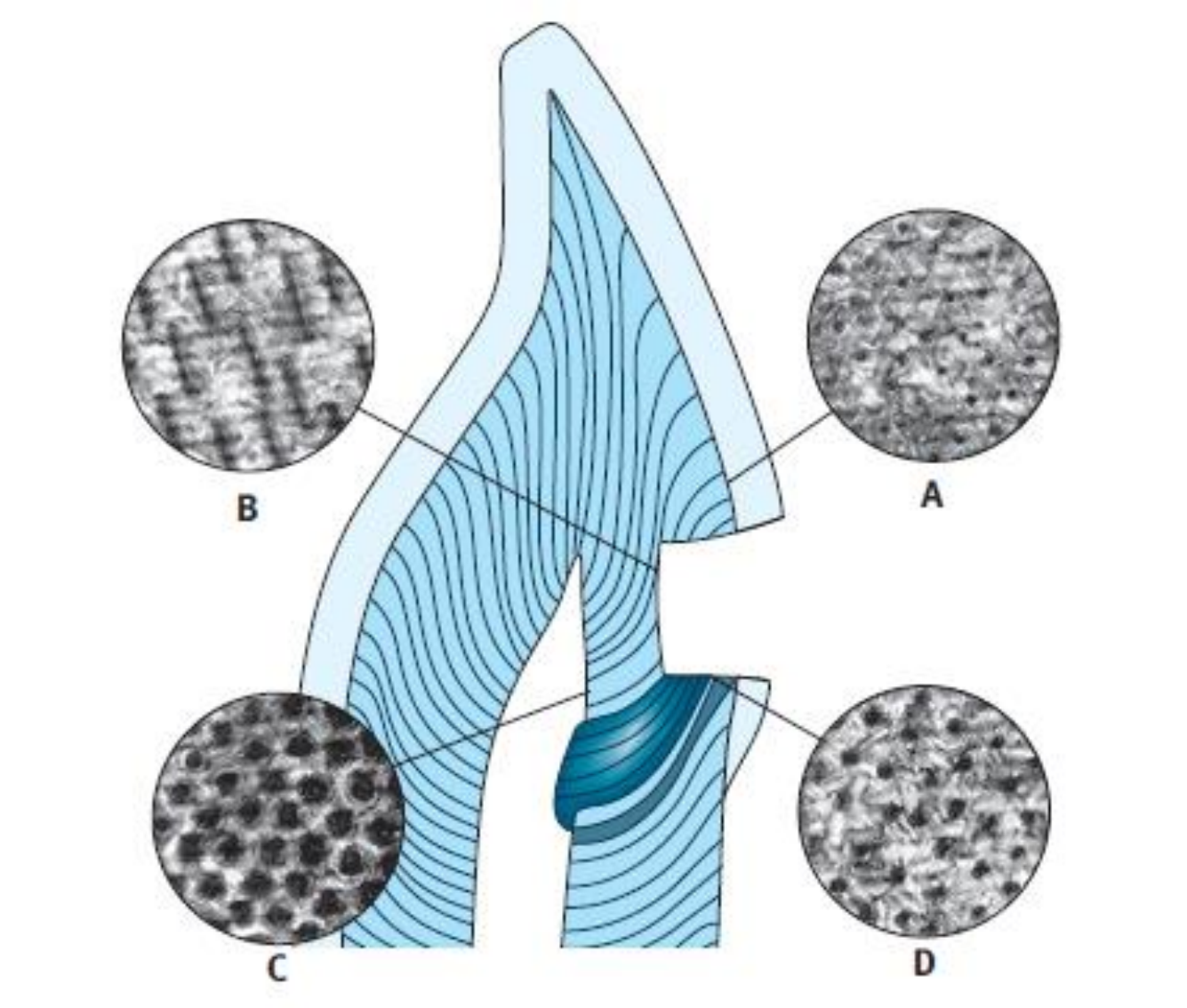


Dentinal Tubules:

- Dentinal tubules as many as 15000 dentinal tubules per square millimeter are present on the root surface at the cervical area
- Dentin tubules follow S-shaped contour within the crown while in the root portion it follows a straight course.



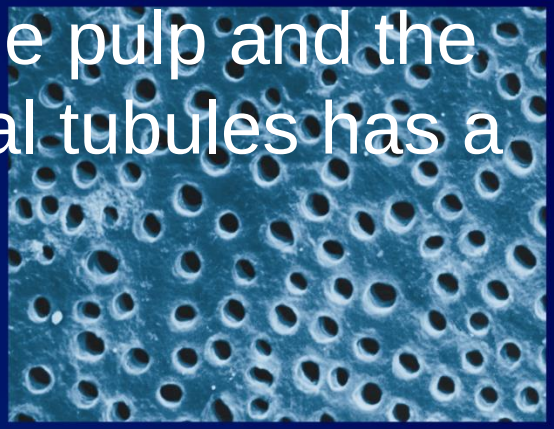
Dentin



Kumar G S. *Orban's Oral Histology and Embryology, 13TH Edition.* ; 94

Dentinal Tubules:

- The openings of dentinal tubules can be affected and obliterated with age, in response to sclerosis or calcifications.
- cementum acting as a protective barrier to the dentin
- If cementum is removed for any reason the direct communication between the pulp and the periodontium through this dentinal tubules has a good chance to be established.



Dentin

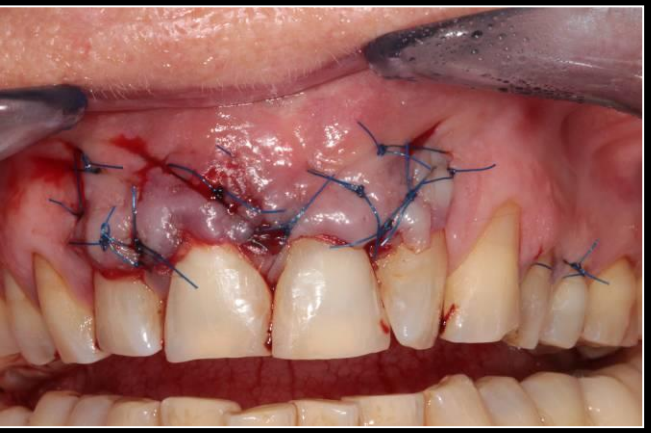






baseline

after restoration



Mucogingival surgery

two weeks

6 weeks postop

Baseline

restoration

1 year

1,5 years

2 years postop.

LATERAL AND ACCESSORY CANALS:

De Deus studied 1,140 teeth for accessory canals and found 27.4% exhibited accessory canals

Gutmann evaluated 102 teeth for the presence of accessory canals, and found 25.5% of the studied sample demonstrated accessory canals in furcation area.

LATERAL AND ACCESSORY CANALS:

2790 EXTRACTED TEETH % OF LATERAL CANALS

UPPER INCISIORS 22%
UPPER CANENES 18%
UPPER PREMOLARS 19%
UPPER MOLARS 16%
LOWER INCISORS 10%
LOWER CANINES 12%
LOWER PREMOLARS 19%
LOWER MOLAR 13%
Hess W: The anatomy of the root canals of the teeth of the permanent dentition 1925.

De Deus studied 1,140 teeth for accessory canals and found 27.4% exhibited accessory canals

Gutmann evaluated 102 teeth for the presence of accessory canals, and found 25.5% of the studied sample demonstrated accessory canals in furcation area.

Accessory canals

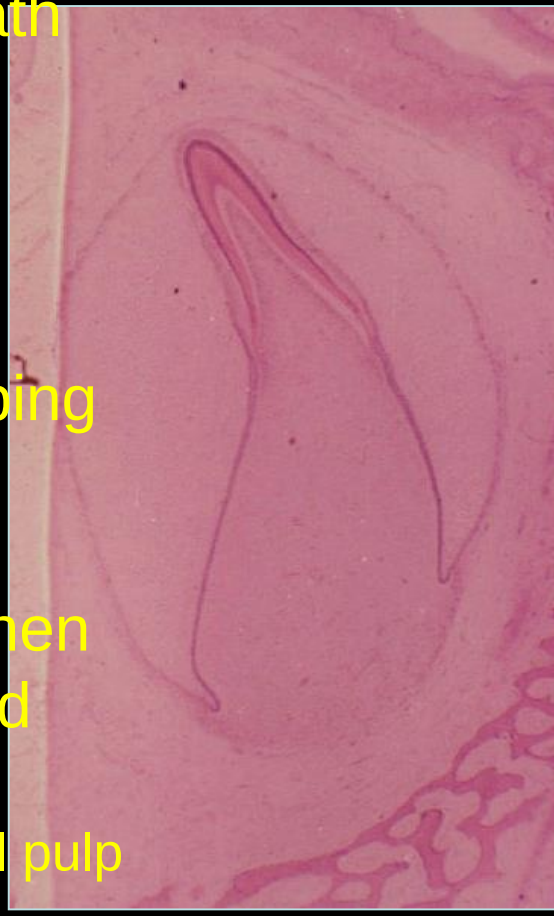
can be seen around the furcation area

they usually develop in areas where root sheath cells are missing,

contain connective tissue and blood vessels.

Accessory canals also develop where developing root meet a blood vessel.

If located in the area where dentin is forming then hard tissue develop around the vessels and form lateral canals



Kramer IR: The vascular architecture of the human dental pulp Arch Oral Biol 1960 .

ACCESSORY CANALS

IN THE FURCATION AREA THE DIAMETER RANGING BETWEEN
4 um 250 um

Koenigs JF. et al: Preliminary scanning electron microscopic investigations of accessory foranina in the furcation areas of human molar teeth Oral Surg. 1974.

LATERAL AND ACCESSORY CANALS

Its role in pulpo-periodontal pathology :

Histological studies

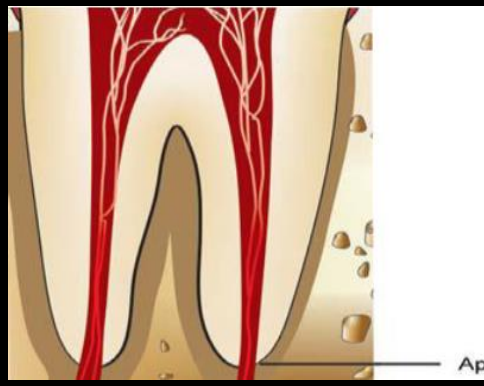
Caries free healthy extracted teeth

Caries free periodontally involved extracted teeth

Both had histological signs of disturbancies

Czarnecki RT & Schilder H: A histological evaluation of the human pulp in teeth with varying degrees of periodontal disease J. Endodont 1979;5:242-253

LATERAL AND ACCESSORY CANALS:



Periodontitis leads to total pulp necrosis if the bottom of the pocket reached the apex

Langeland KS. et al: Periodontal disease bacteria and pulpal histopathology Oral Surg, Med Path 1964; 17:592-603

Etiology

An established EPL is always associated with varying degrees of microbial contamination of the dental pulp and the supporting periodontal tissues.

THE PRIMARY ETIOLOGY

- endodontic
- and/or periodontal infections
- trauma
- and/or iatrogenic factors.

•**Endodontal pathology with secondary periodontal involvement**

Isolated bacteria

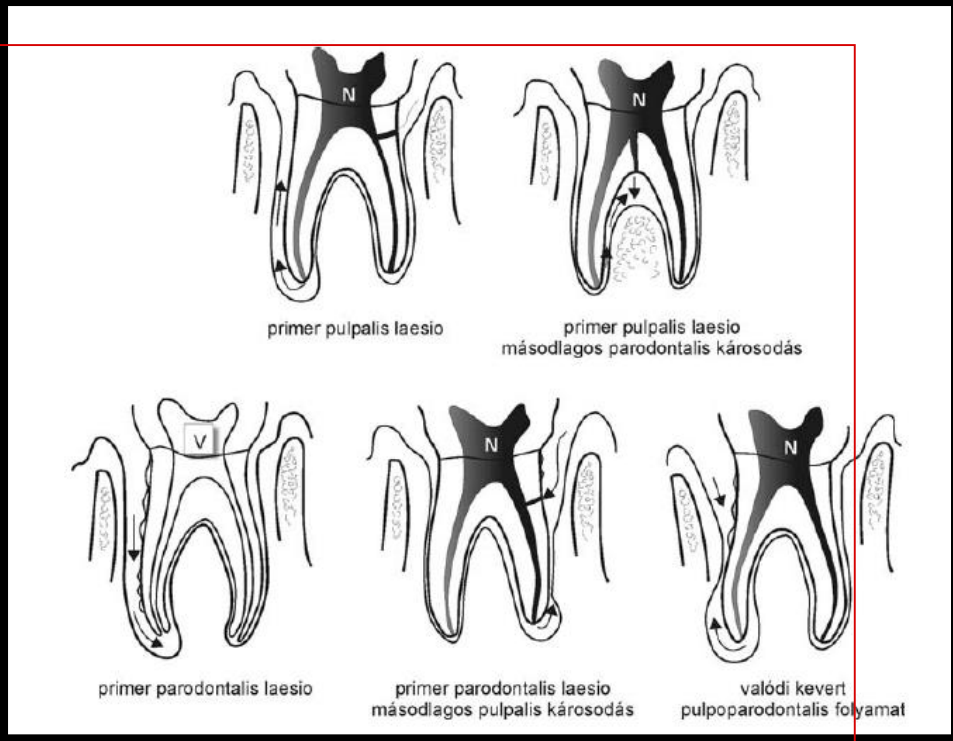
the necrotic pulp is a bacterial reservoir

Fusobacterium
Prevotella
Porphyromonas
Capnocytophaga,
Eubacterium
spirochetak

Sundquist: Endodontic microbiology 1990

Based on etiology, diagnosis, prognosis and treatment (Simon's Classification)

- Primary endodontic lesion
- Primary periodontal lesion
- Primary endodontic with secondary periodontal involvement
- Primary periodontal with secondary endodontic involvement
- True combined lesions



Simon, JHS., Glick DH., Frank AL.: The relationship of endodontic-periodontic lesions J. Periodon 1972.

Classification of endodontal and periodontal lesions

- Endodontal pathology with secondary periodontal involvement
- Periodontal pathology with secondary endodontal involvement
- True combined lesions
- Vertical root fracture

Grant DA., Stern IB., Everett FG.: Periodontics in the tradition of Orban and Gottlieb 1972.

•Endodontal pathology with secondary periodontal involvement

Endodontal failures

•Root perforation –”via falsa”

•Sealer or guttaperche in the periapical region foreign body reaction

•Sealer in the lateral canal and foreign body reaction in the lateral PDL

2017 WORLD WORKSHOP

Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions

TABLE 6 Proposal for endo-periodontal lesions classification

Endo-periodontal lesion with root damage	Root fracture or cracking	
	Root canal or pulp chamber perforation	
	External root resorption	
Endo-periodontal lesion without root damage	Endo-periodontal lesion in periodontitis patients	*Grade 1* – narrow deep periodontal pocket in 1 tooth surface
		Grade 2 – wide deep periodontal pocket in 1 tooth surface
		Grade 3 – deep periodontal pockets in more than 1 tooth surface
	Endo-periodontal lesion in non-periodontitis patients	*Grade 1* – narrow deep periodontal pocket in 1 tooth surface
		Grade 2 – wide deep periodontal pocket in 1 tooth surface
		Grade 3 – deep periodontal pockets in more than 1 tooth surface

2017 WORLD WORKSHOP

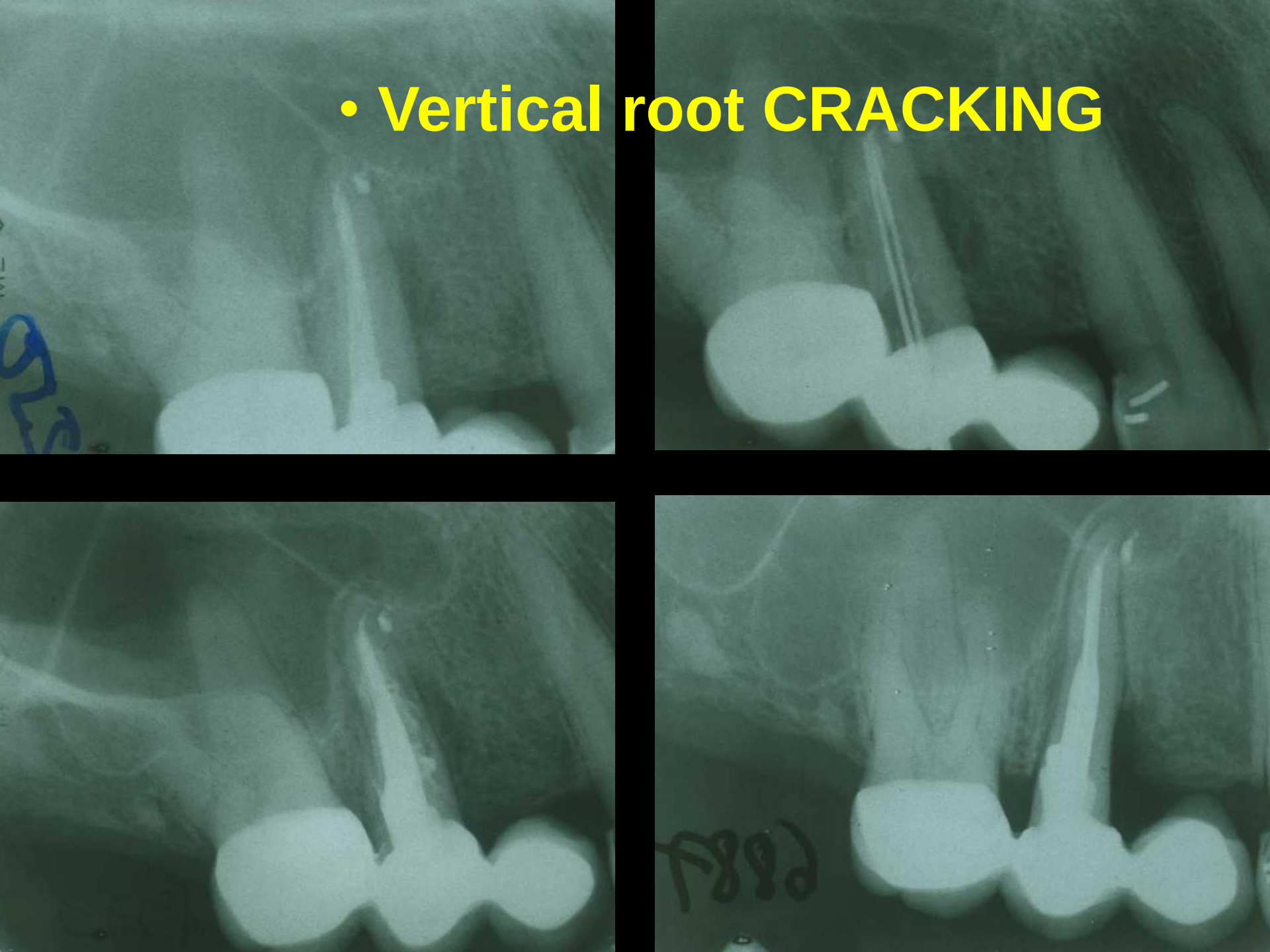
ENDO-PERIODONTAL LESIONS WITH ROOT DAMAGE

- ROOT CRACKING
- ROOT FRACTURE
- ROOT CANAL/CHAMBER PERFORATION
- EXTERNAL ROOT RESORBTION

2017 WORLD WORKSHOP

ENDO-PERIODONTAL LESIONS WITH ROOT DAMAGE

- ROOT CRACKING
- ROOT FRACTURE
- ROOT CANAL/CHAMBER PERFORATION
- EXTERNAL ROOT RESORBTION


• Vertical root CRACKING

2017 WORLD WORKSHOP

ENDO-PERIODONTAL LESIONS WITH ROOT DAMAGE

ROOT CRACKING

ROOT FRACTURE

ROOT CANAL/CHAMBER PERFORATION

EXTERNAL ROOT RESORBTION

- Vertical root fracture


•Vertical root fracture

• Vertical root fracture

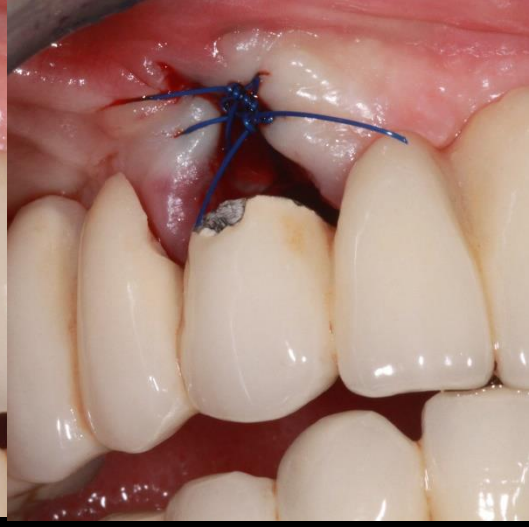
Clinical and radiological diagnosis

Many times it is difficult to differentiate from localized aggressive periodontitis

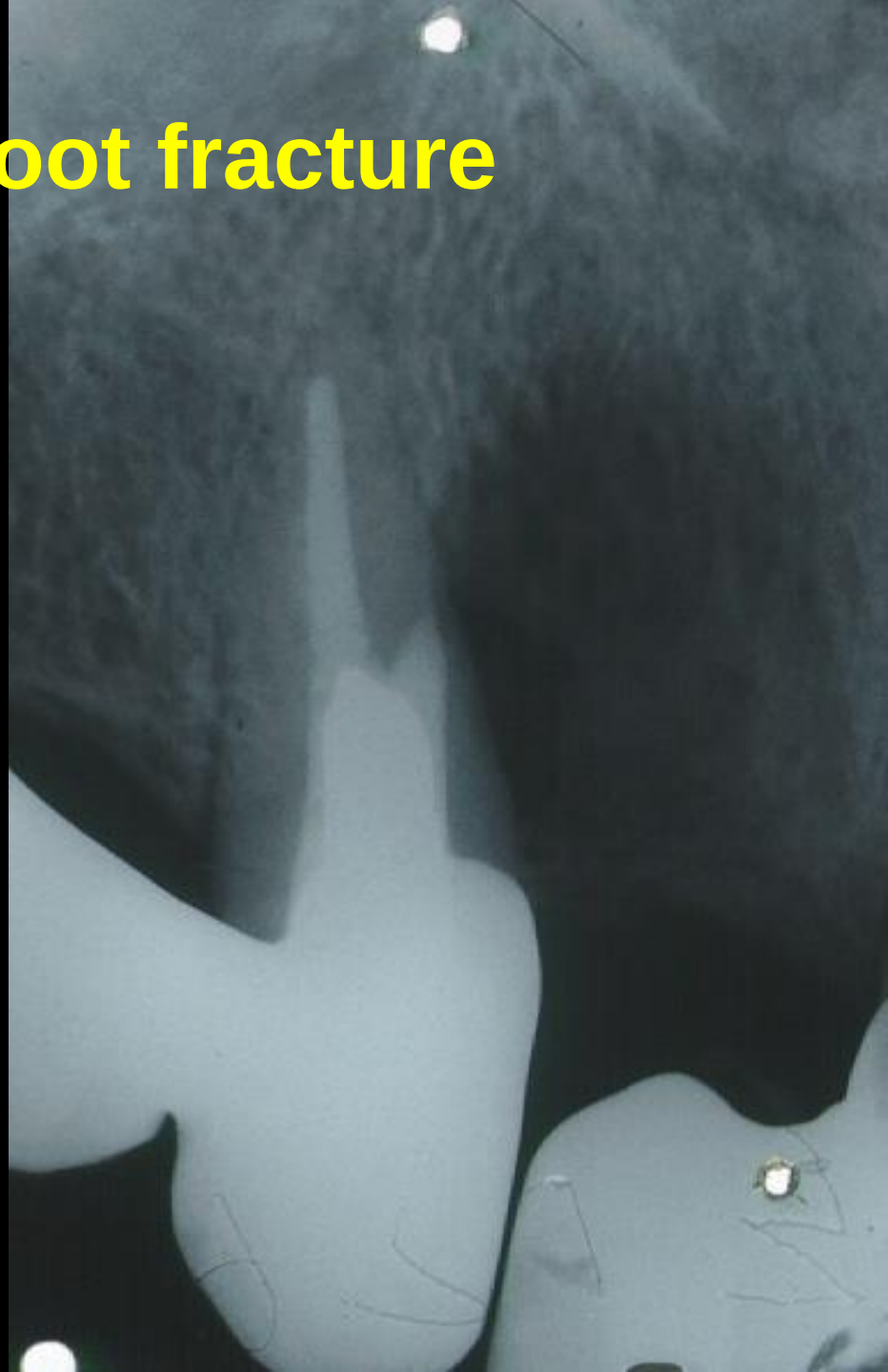
The majority of the single rooted teeth are to be extracted

Multi rooted teeth can be dissected



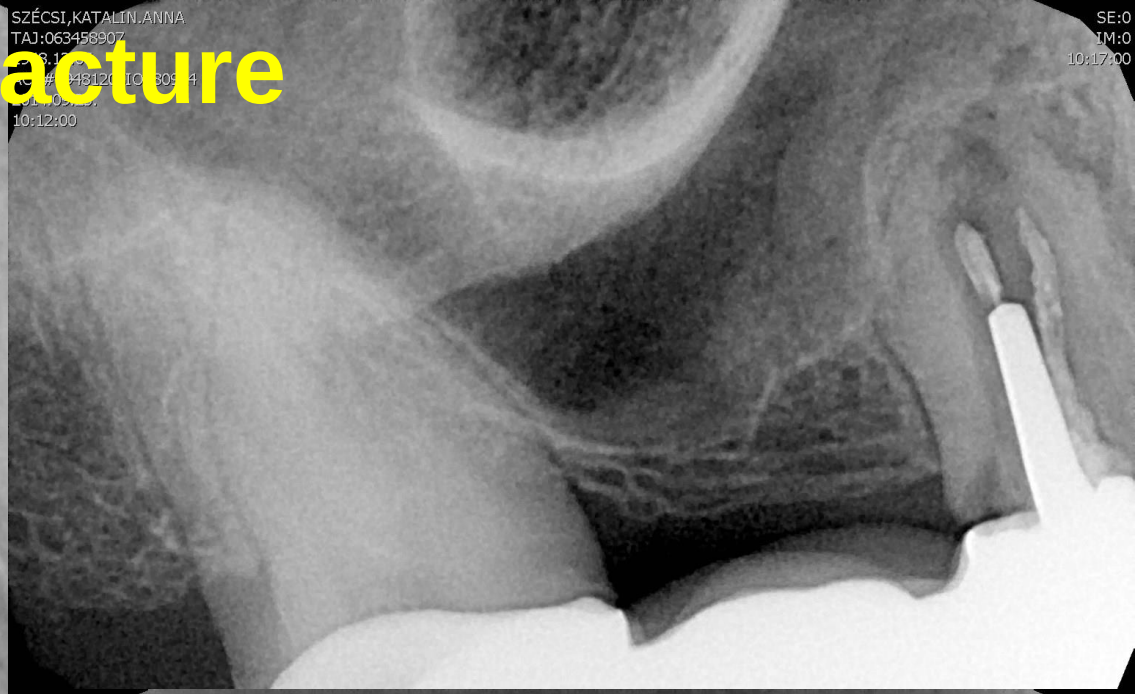


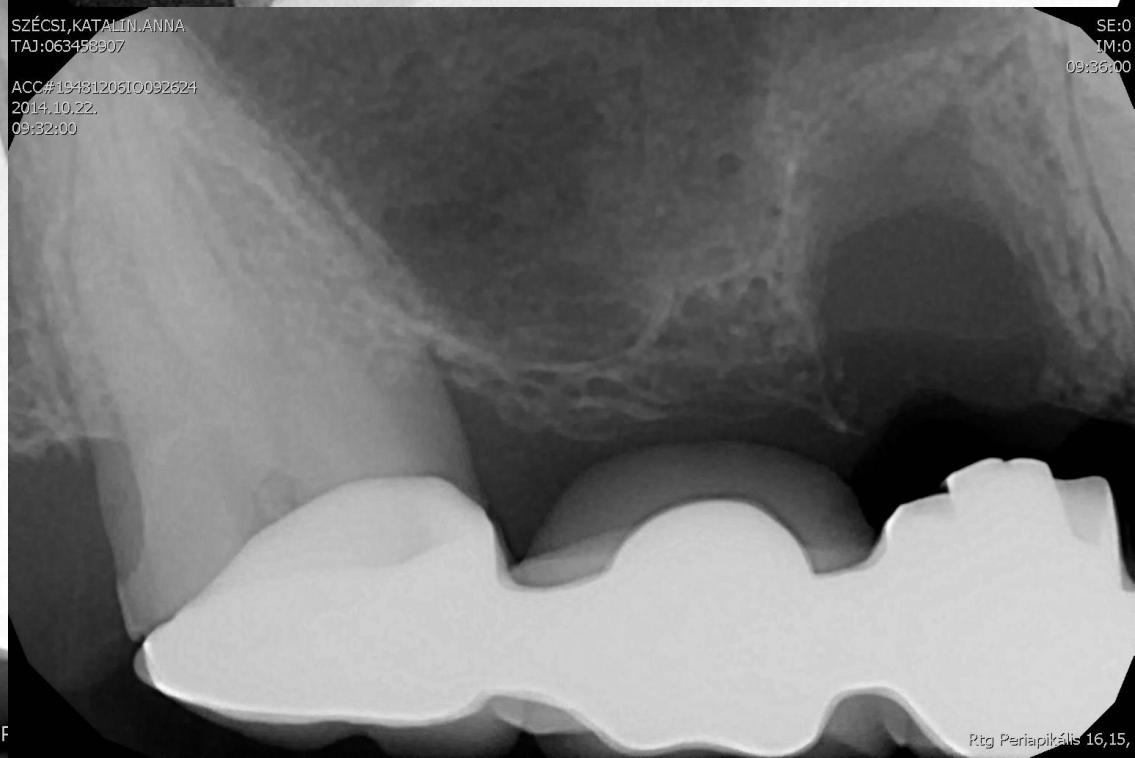

- Vertical root fracture



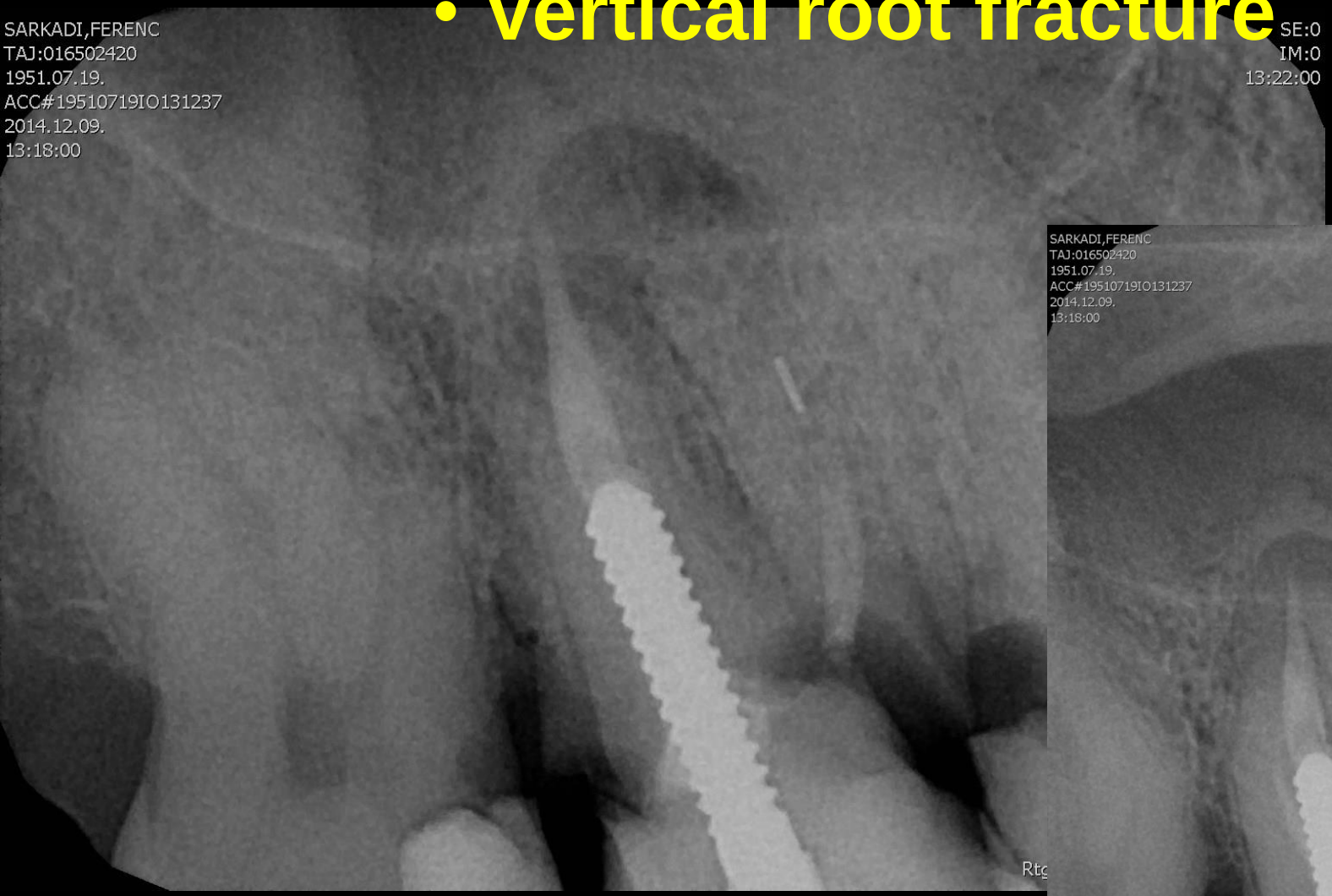
- **Vertical root fracture**

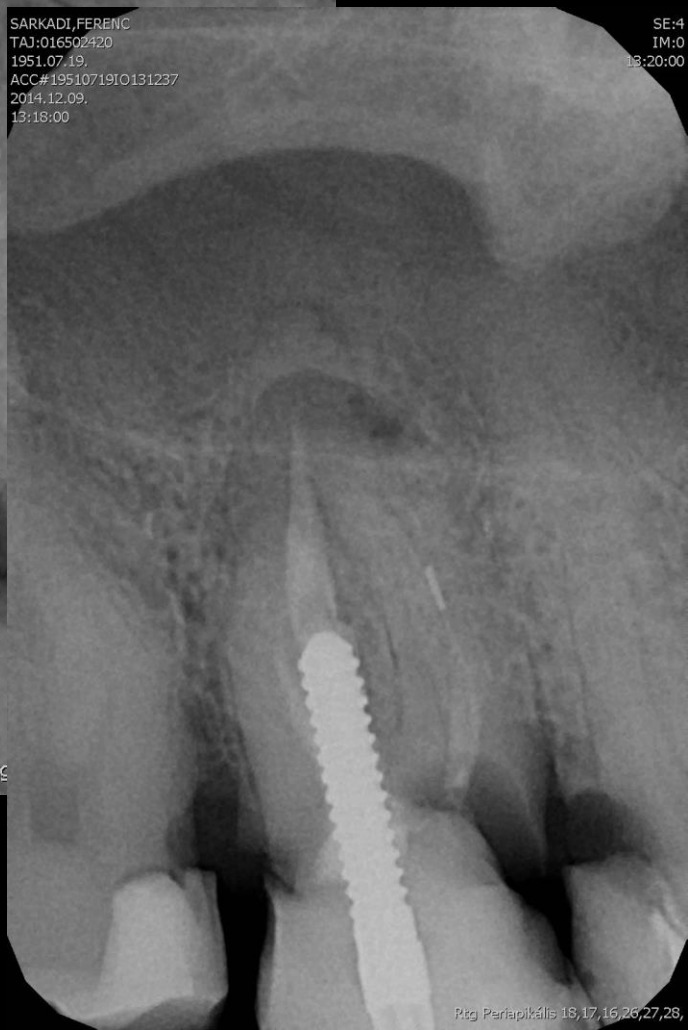
Vertical root fracture





• Vertical root fracture

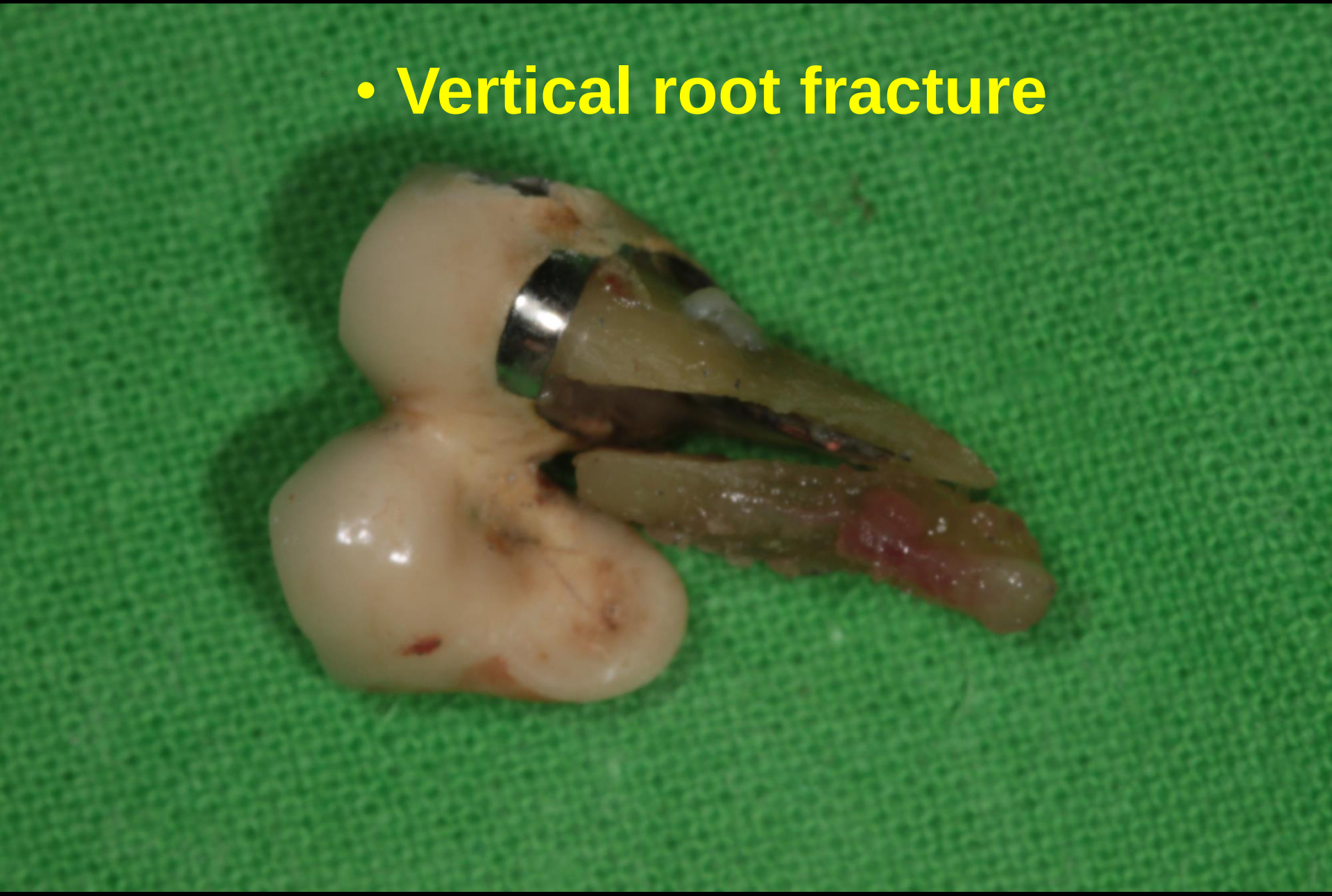


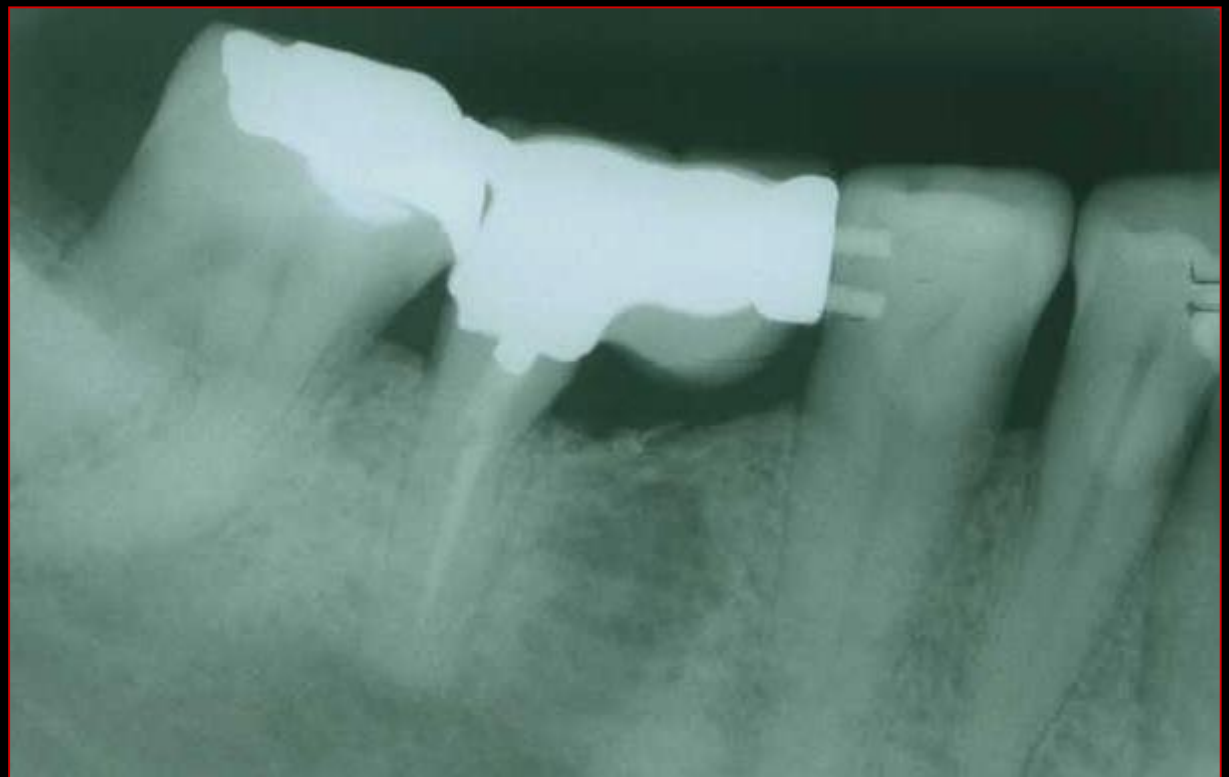


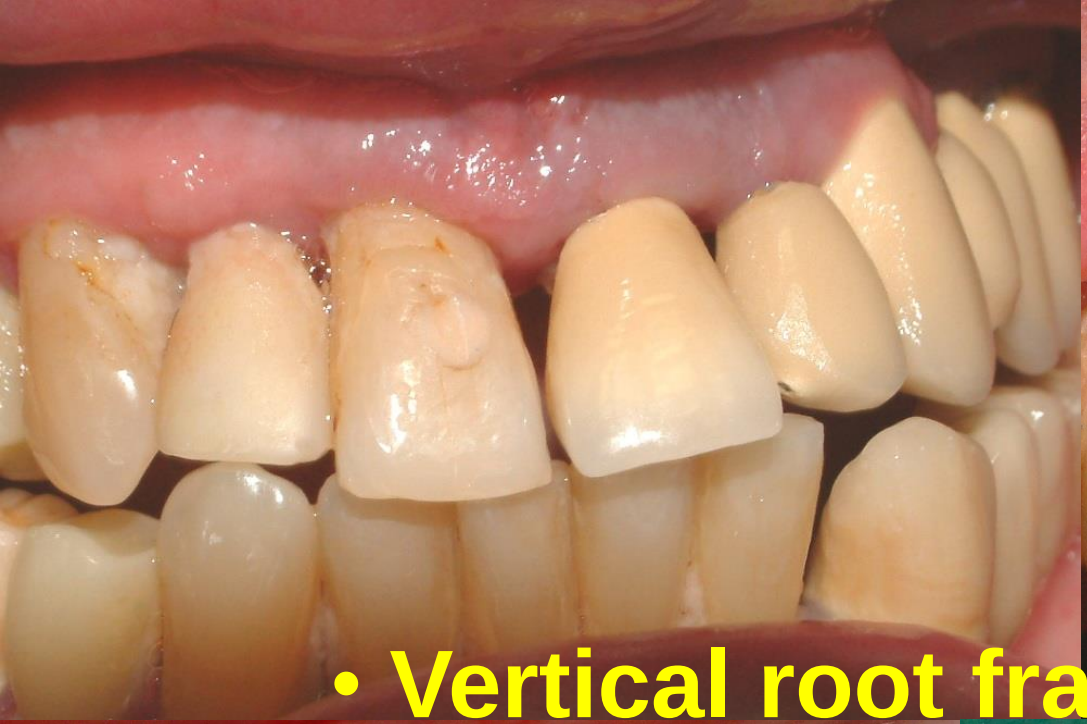
- Vertical root fracture


• Vertical root fracture

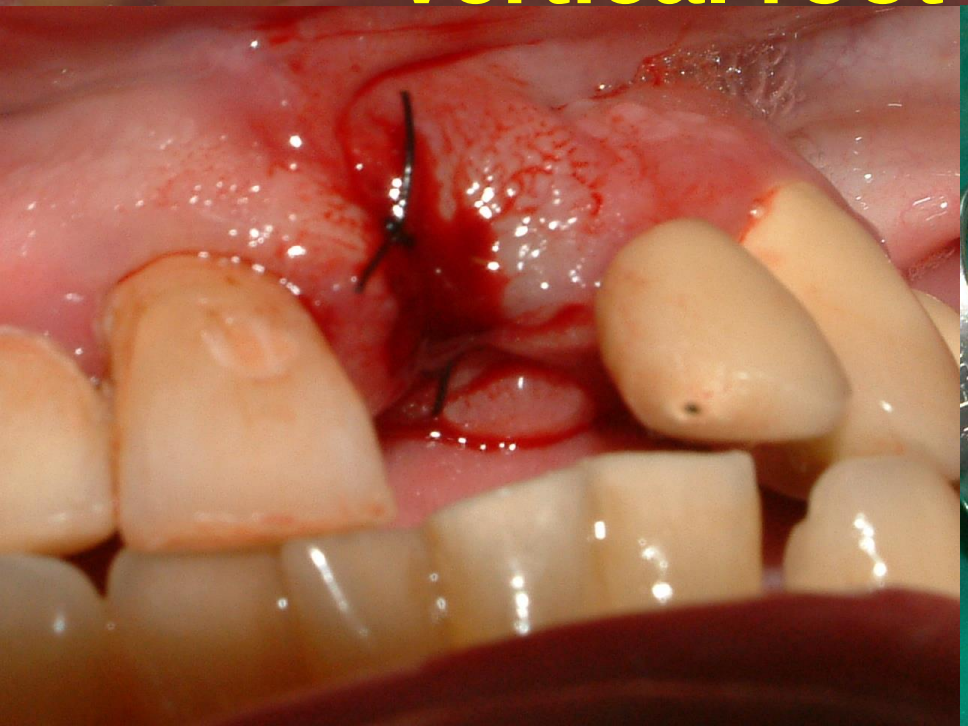
- Vertical root fracture

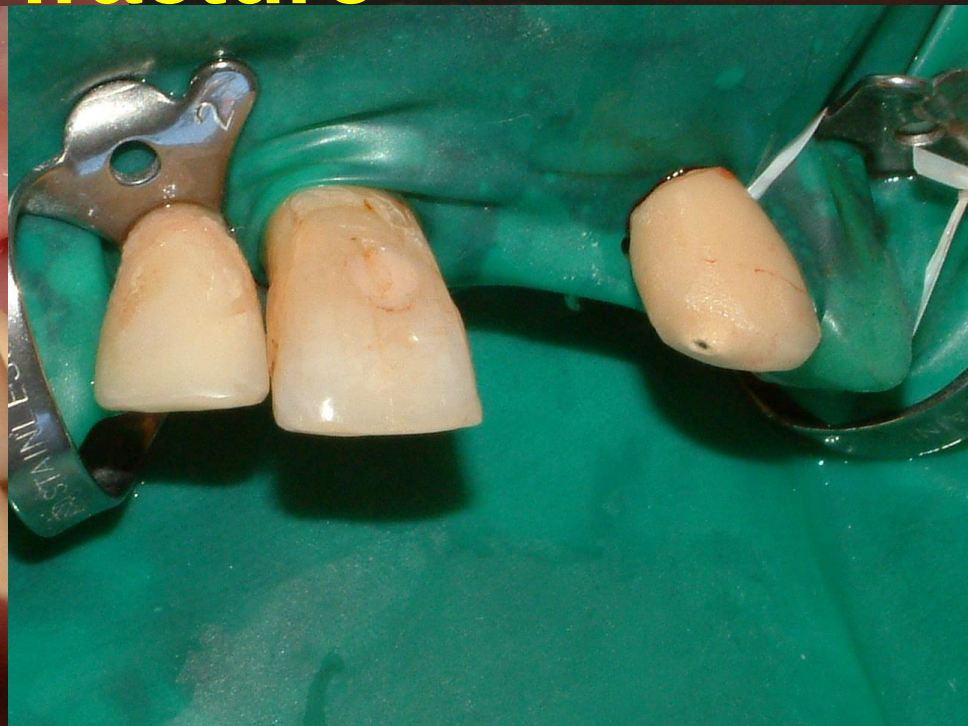






- Vertical root fracture





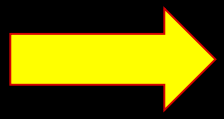

- **Vertical root fracture**


2017 WORLD WORKSHOP

ENDO-PERIODONTAL LESIONS WITH ROOT DAMAGE

ROOT CRACKING

ROOT FRACTURE



ROOT CANAL/CHAMBER PERFORATION

EXTERNAL ROOT RESORBTION

2017 WORLD WORKSHOP

ENDO-PERIODONTAL LESIONS WITH ROOT DAMAGE

ROOT CRACKING

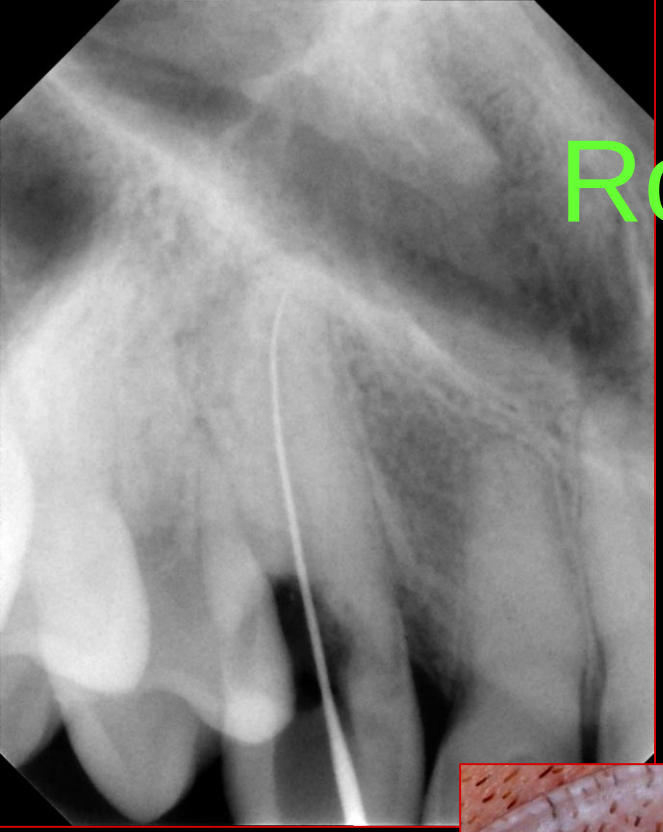
ROOT FRACTURE

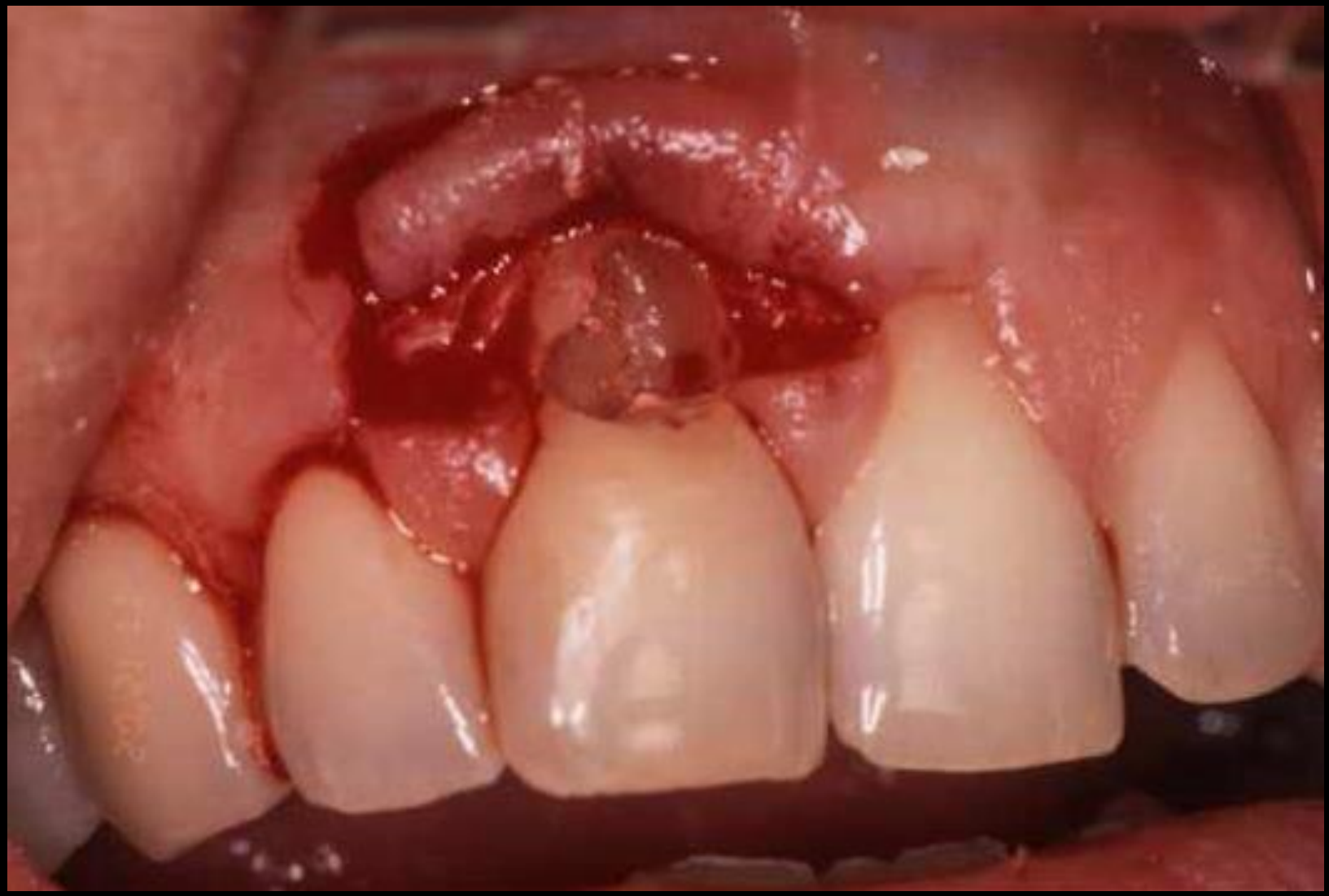
ROOT CANAL/CHAMBER PERFORATION

EXTERNAL ROOT RESORBTION

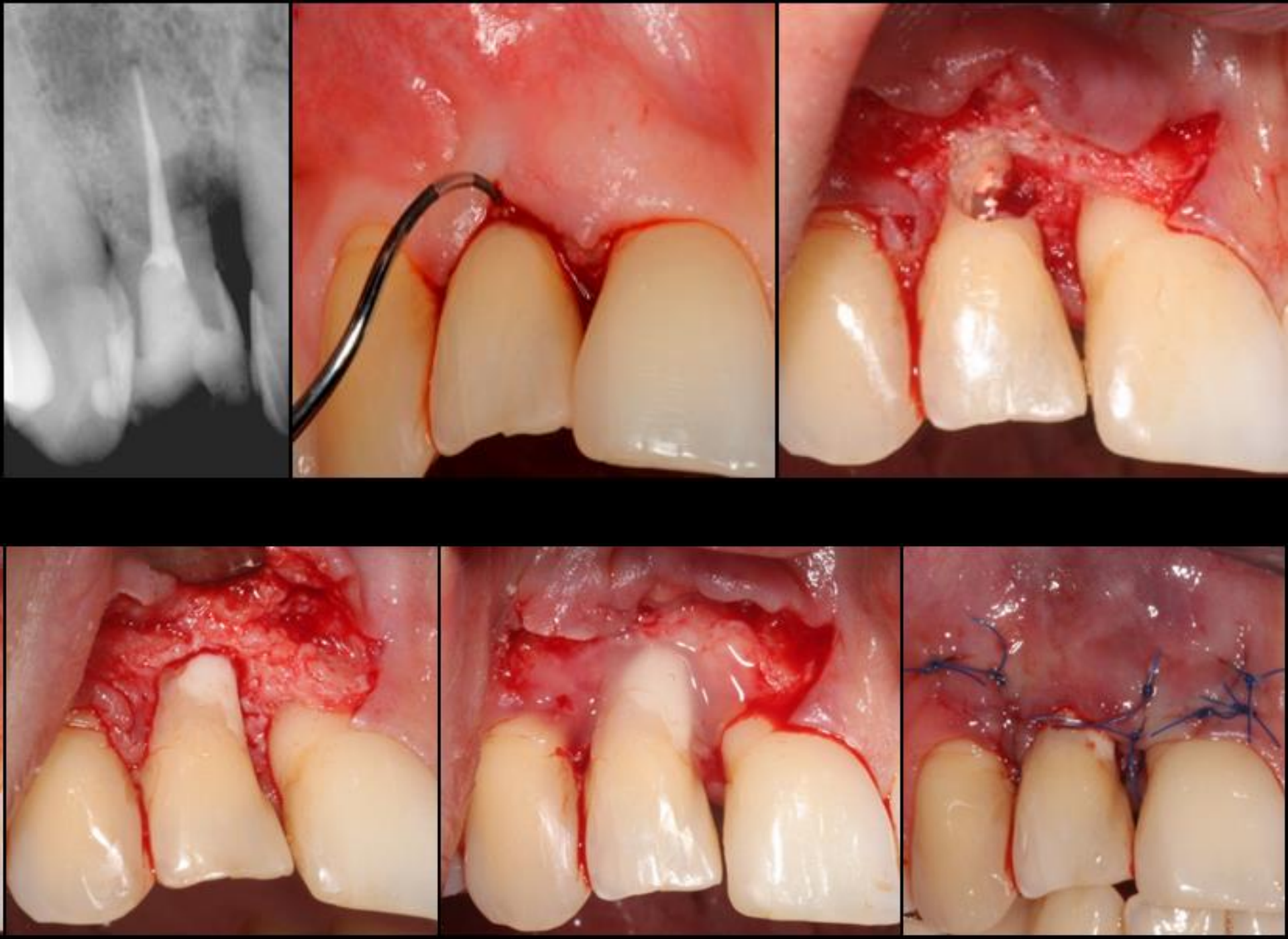
Root resorption

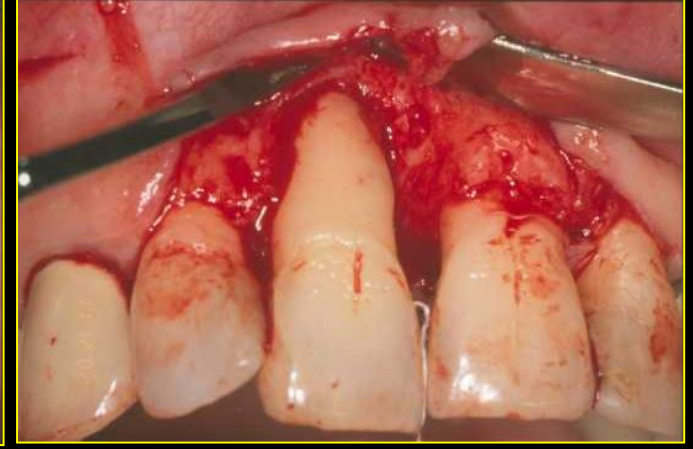
Root resorption

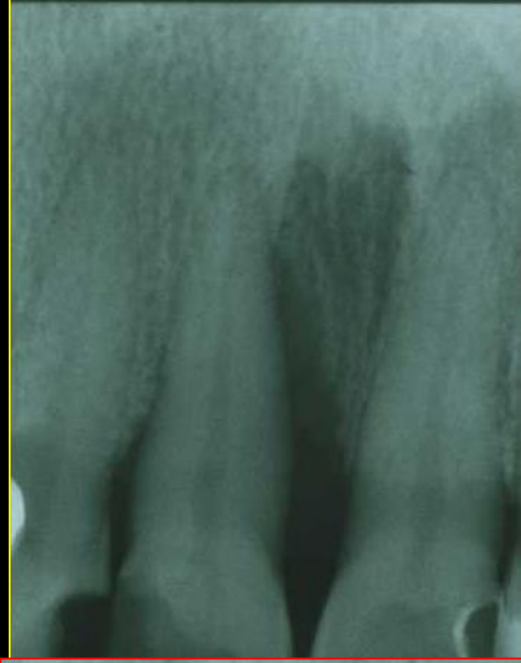






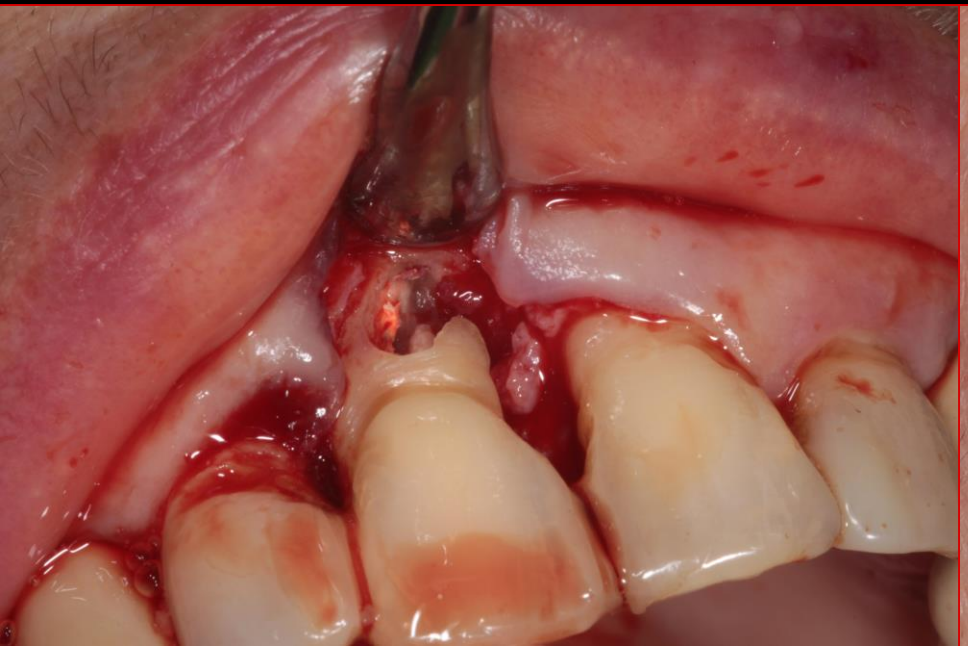


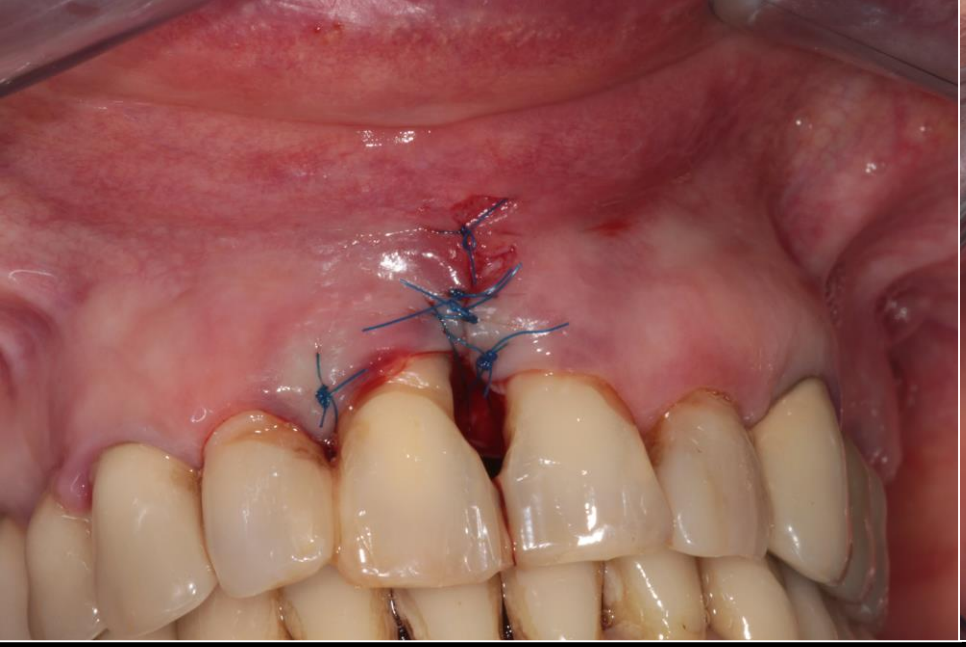


1998

2001

2011





2012 dec

2004. 11.03

2013. 06.10.




2017 WORLD WORKSHOP

Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions

TABLE 6 Proposal for endo-periodontal lesions classification

Endo-periodontal lesion with root damage	Root fracture or cracking	
	Root canal or pulp chamber perforation	
	External root resorption	
Endo-periodontal lesion without root damage	Endo-periodontal lesion in periodontitis patients	*Grade 1* – narrow deep periodontal pocket in 1 tooth surface
		Grade 2 – wide deep periodontal pocket in 1 tooth surface
		Grade 3 – deep periodontal pockets in more than 1 tooth surface
	Endo-periodontal lesion in non-periodontitis patients	*Grade 1* – narrow deep periodontal pocket in 1 tooth surface
		Grade 2 – wide deep periodontal pocket in 1 tooth surface
		Grade 3 – deep periodontal pockets in more than 1 tooth surface

ENDO-PERIODONTAL LESIONS WITHOUT ROOT DAMAGE

1. endo-periodontal lesions in periodontal patients

2. endo-periodontal lesions in non - periodontal patients

1. endo-periodontal lesions in periodontal patients

Periodontal pathology with secondary endodontal involvement

85 hopeless periodontally involved extracted teeth

- 5 totally intact pulp tissue
- 23 atrophic degeneration
- 42 partial chronic pulpitis
- 15 total necrosis

Seltzer S, et al. The interrelationship of pulp and periodontal disease Oral Surg. 1963.

LATERAL AND ACCESSORY CANALS

ITS ROLE IN PULPO-PERIODONTAL PATHOLOGY :

100 subjects' 387 teeth with more that 50% periodontal attachment loss followed up for 2-25 years

Total 14 teeth needed root canal therapy

Ross IF & Thompson RH: A long term study of root retention in the treatment maxillary molars with furcation involvement J Periodontol 1978;49: 238-244

LATERAL AND ACCESSORY CANALS

ITS ROLE IN PULPO-PERIODONTAL PATHOLOGY :

52 subjects' 417 teeth with more that 50% periodontal attachment loss followed up for 4-13 years

Total 14 teeth needed root canal therapy

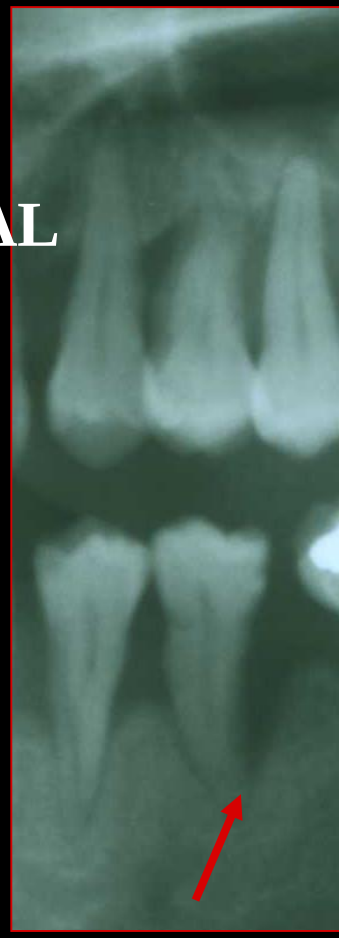
But 15% of the 255 abutments needed root canal therapy

Bergenholtz G & Nyman S: Endodontic complications following periodontal and prosthetic treatment of patients with advanced periodontal disease furcation involvement J Periodontol 1984;55: 63-68

•Periodontal pathology with secondary endodontal involvement

IN THE DEEP PERIODONTAL POCKET LATERAL CANANS CAN BE EXPOSED TO BIOFILM

Until the blood circulation is maintained thought the main apical canal no total pulp necrosis occurs



Langeland K. et al: Periodontal disease, bacteria and pulpal histopathology Oral Surg. 1974.

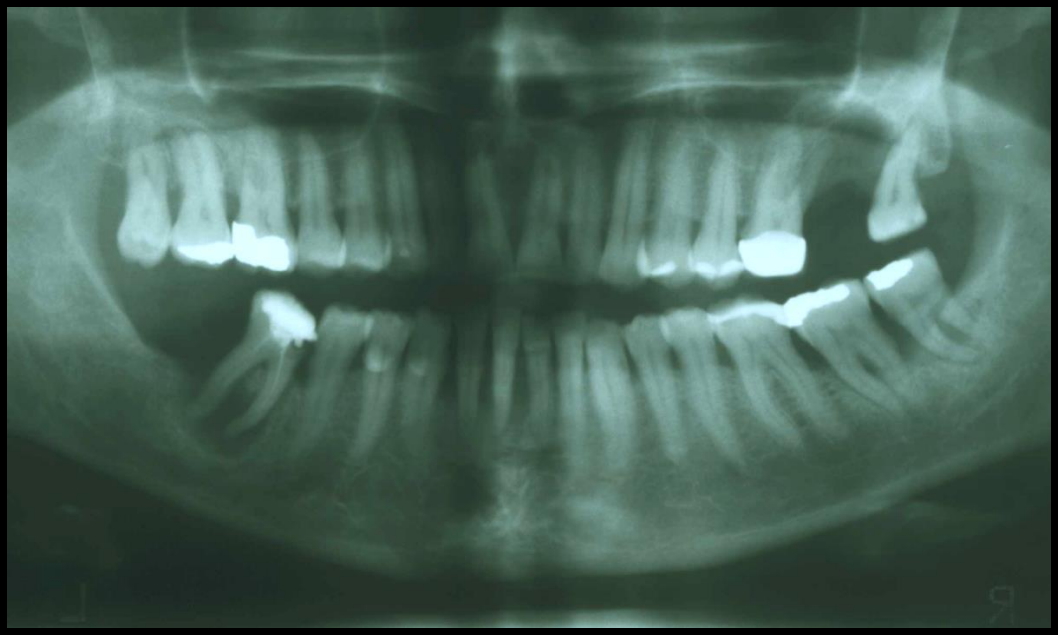
ENDO-PERIODONTAL LESIONS IN NON - PERIODONTAL PATIENTS

Non treated necrotic pulp leads to periapical lesions in 95%

Although via the lateral or accessory canals can result in lateral periododntal granuloma

Classification of endodontal and periodontal lesions

- Endodontal pathology with secondary periodontal involvement



- **Endodontal pathology with secondary periodontal involvement**

In dentine tubuli of the extracted non vital teeth abundant anaerobic microorganisms were detected.

Chirnside IM: Bacterial invasion of non-vital dentin J. Dent Res. 196

PERIAPICALI GRANULOMA

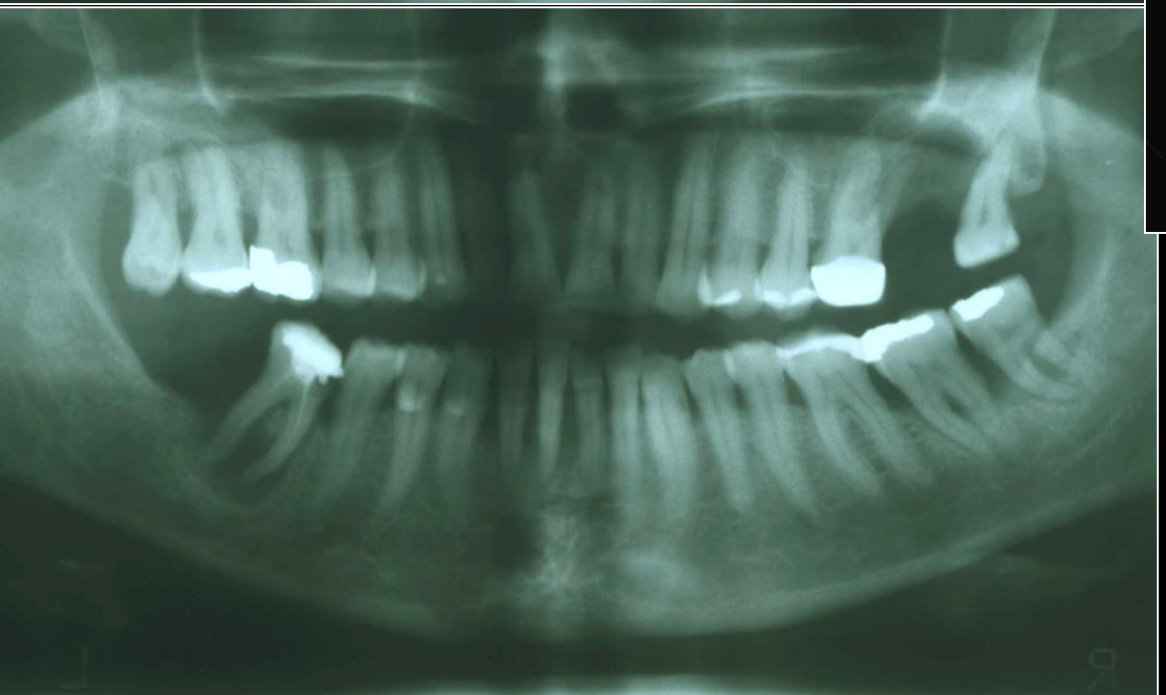
- after the initial inflammation - a steady stable reaction develops
- the protective immune reactions and the bacterial activity get an equilibrium and balanced - this might last for years
- Histologically around the apex a well circumcised barrier develops consisting PMN cells,
- The alveolar bone is separated by a fibrotic capsule. The bacterial content of the granuloma is minimal

PERIAPICAL GRANULOMA

- Bacteria growing in the root canal and its toxins are neutralized by the barrier cells of the granulation tissue in the granuloma. .

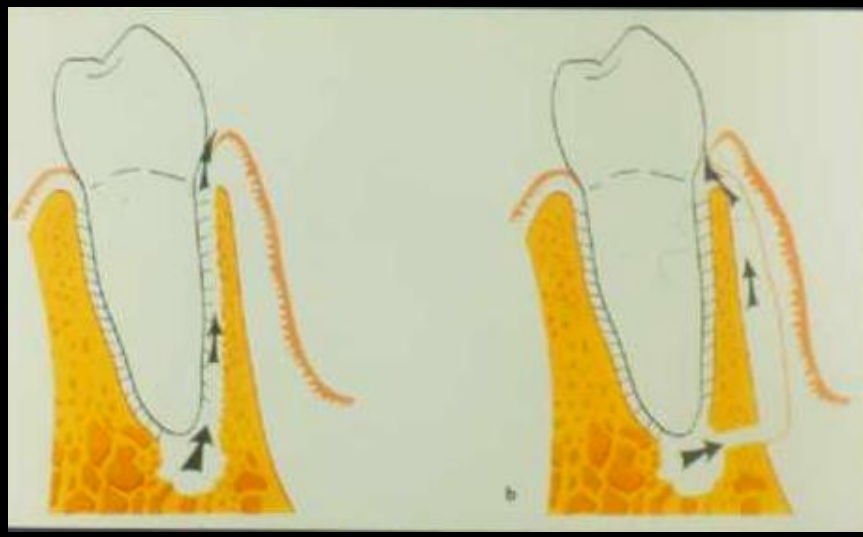
•*(*Márton I & Kiss Cs. Protective and destructive immune reactions in apical periodontitis Oral Microbiol and Immunol 2000;15:139-150.)


VOSZKA,ÉVA.DR
TAJ:067134461
1953.09.17.
ACC#19530917IO113103
2013.01.09
11:51:08
SE:6
IM:3
11:56:17
GxPicture Control
FMX 18
Rtg. Periapikális 14,13,12,11,21,22,23,24,



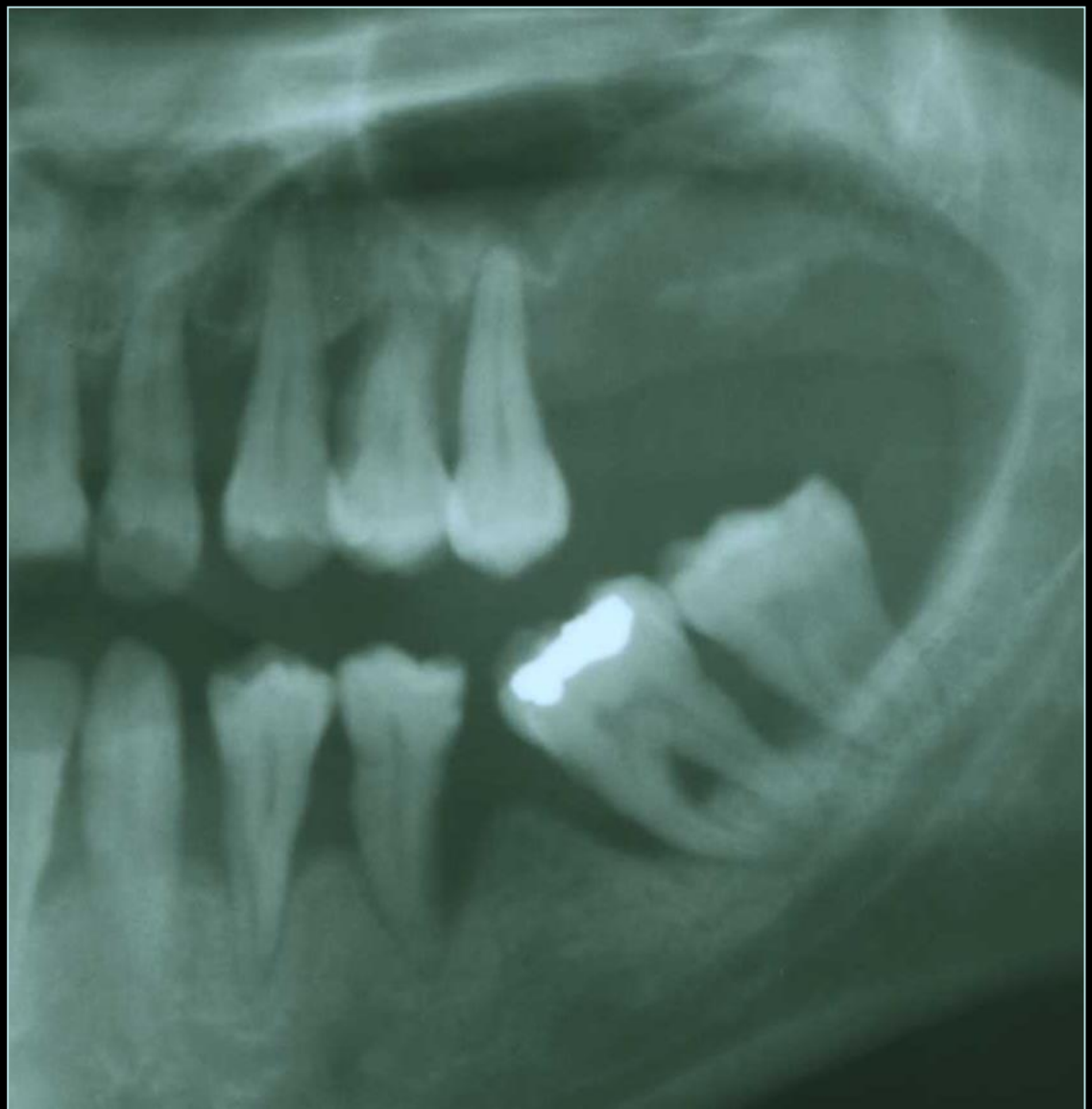
•Endodontal pathology with secondary periodontal involvement

Laterally spreading inflammation enters into the PDL and results in a fistula tract formation and rapid periodontal attachment loss in a localized segment of the periodontium



If the inflammation breaks through the bone entering into the periosteum – cellulitis develops without periodontal attachment loss

•Periodontal pathology with secondary endodontal involvement



therapy

Endodontic therapy correct obturation

Subgingival curettage

Flap surgery

Dissection

hemisection

- True combined lesions

Simultaneously occurs plaque related periodontitis and pulpal damage due to deep caries or chemical/bacterial pulpal damage

THERAPEUTIC APPROACHES

A. Primary endodontic lesion

•Necrotic pulp acute exacerbation or chronic apical lesion

Root canal treatment

B. Primary periodontal lesion

•chronic periodontitis progressing apically along the root surface pulpal effect

- wide periodontal pocket
- vital pulp,
- minimal or no pain,

•Periodontal therapy

THERAPEUTIC APPROACHES

C. Primary endodontic with secondary periodontal involvement

Untreated Primary endodontic lesion

- draining abscess through the periodontium
  sinus tract formation
  creation of secondary periodontal problem.
- Root canal therapy
- After 2-3 months periodontal therapy

D. Primary periodontal with secondary endodontic involvement

- periodontal disease exposes lateral canal
- severe pain, signs of pulpal disease
- periodontal and endodontic therapies are required

THERAPEUTIC APPROACHES

E. True combined lesions:

- Pulpal pathosis progressing coronally and periodontal pathosis progressing apically
- develops independently around the same tooth and at the same time unite.
- have significant periodontal involvement with considerable attachment loss
- periodontal and endodontic therapies are required


2002.08.06


2002.08.23


2002.10.11


2006.02,06


2006.02.06


2006.02.06


2010.12.11


2012.02.20

The effect of periodontal therapy on the pulp

- Scaling
- Rootplaning
- Apically positioned flap surgery
- Dentin tubuli exposition
- Pulp degeneration




Differential diagnosis

Differential diagnosis

Characteristics of pain

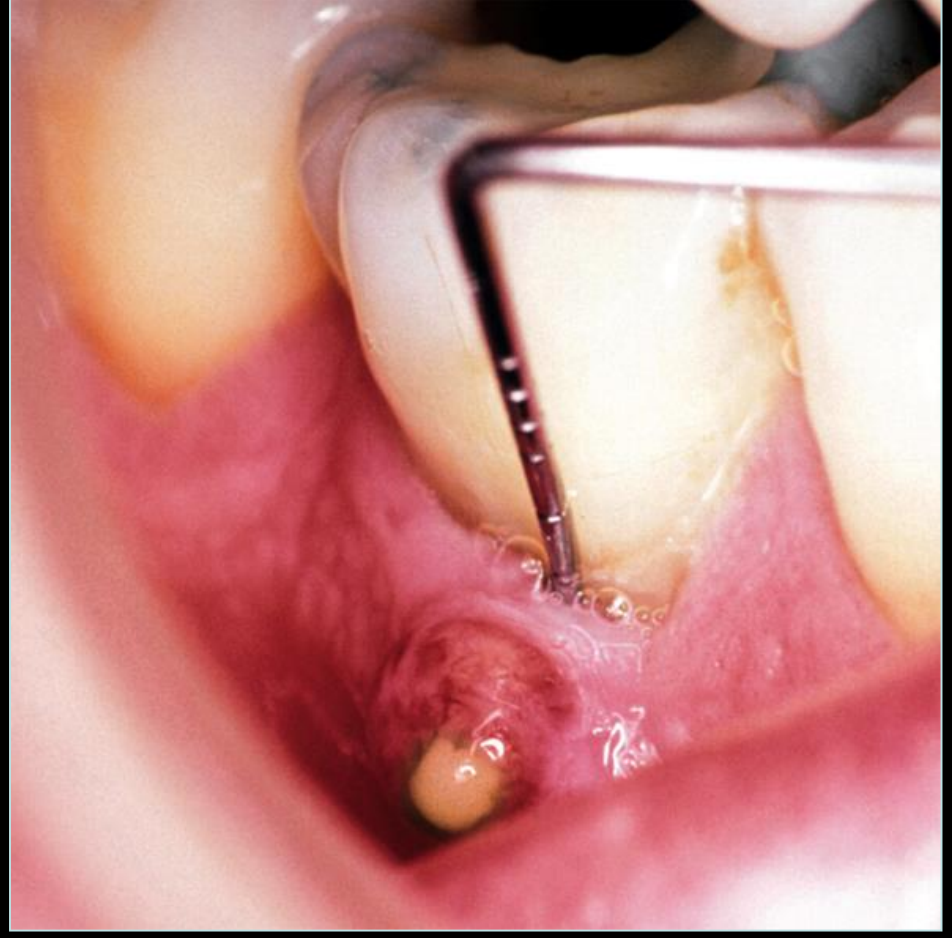
Vitality test

Percussion

Filling or caries

Periododntal pocket

Fistula tract abscess



Periododntal abscess

periapical abscess

Differential diagnosis

Differential diagnosis

Radiological diagnosis

Gutta-percha point put into the fistula tract

Secunder caries

Quality of root canal obturation

Vertical/ horizontal bone loss

Root sensitivity


97 10 29

abrasion

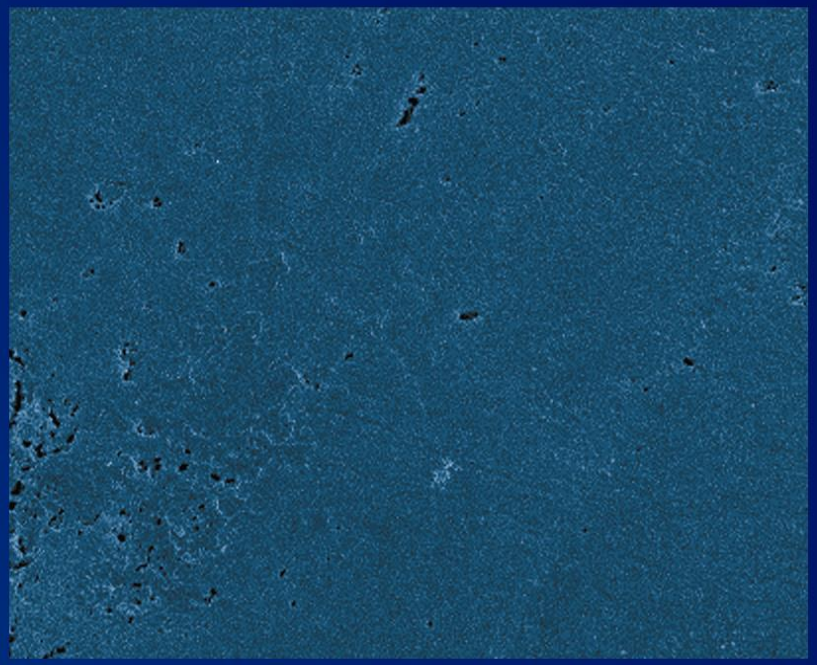
Dentine exposition



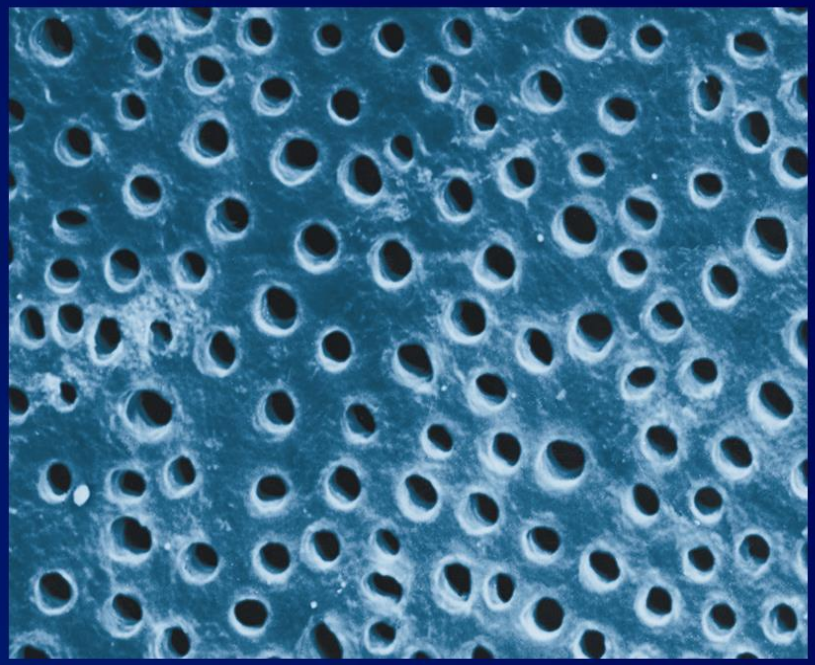




Hard tooth substances

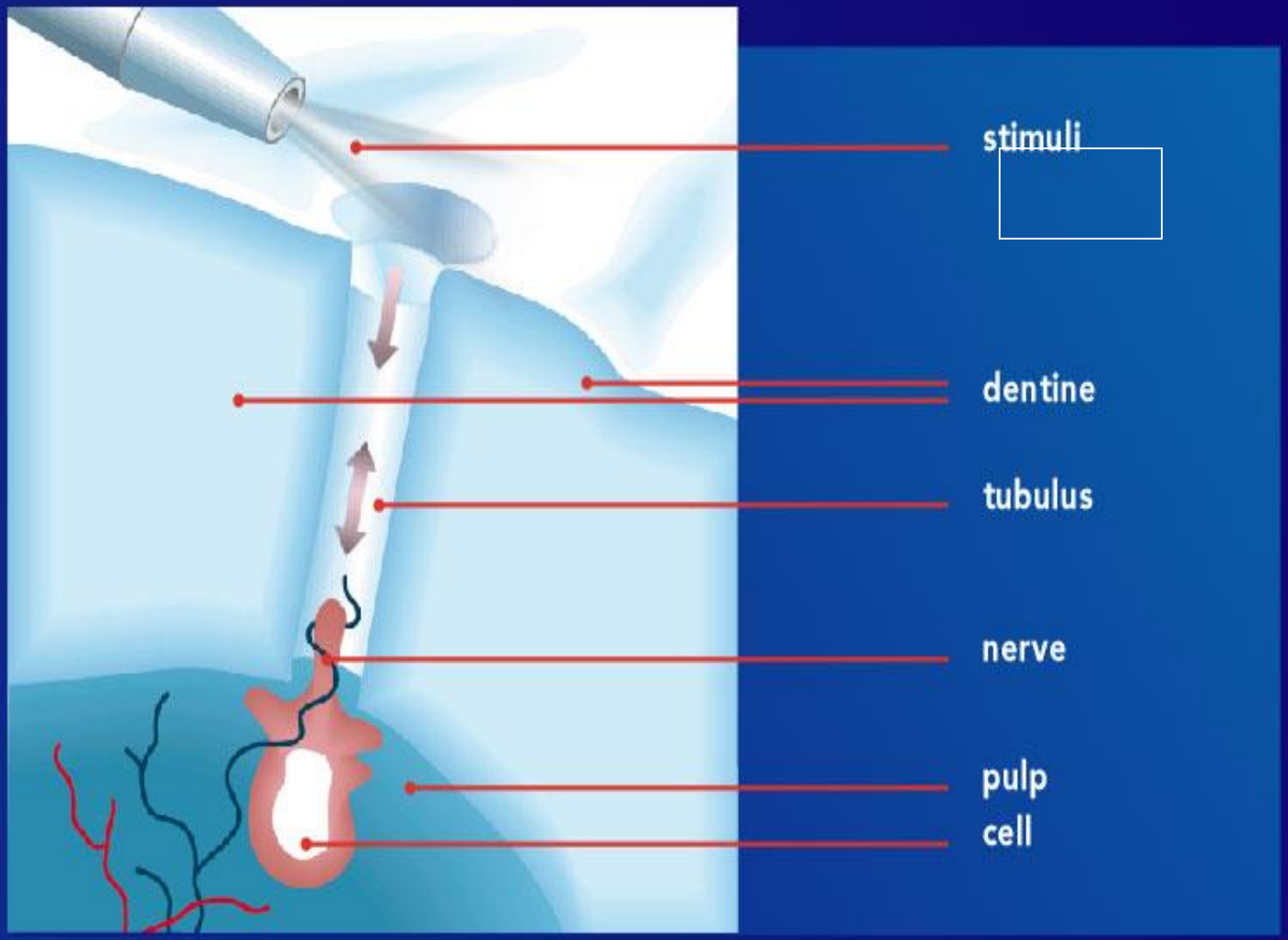


enamel



dentine

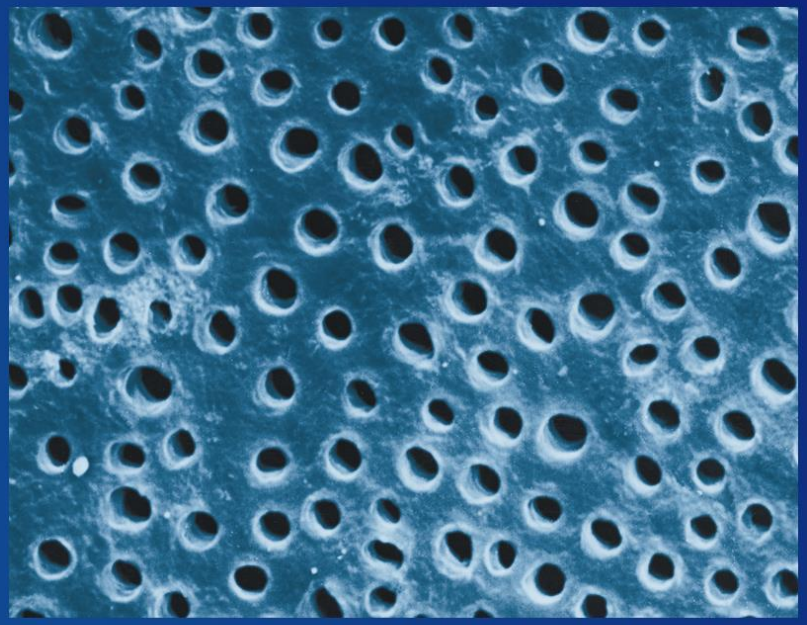
Dentine hypersensitivity



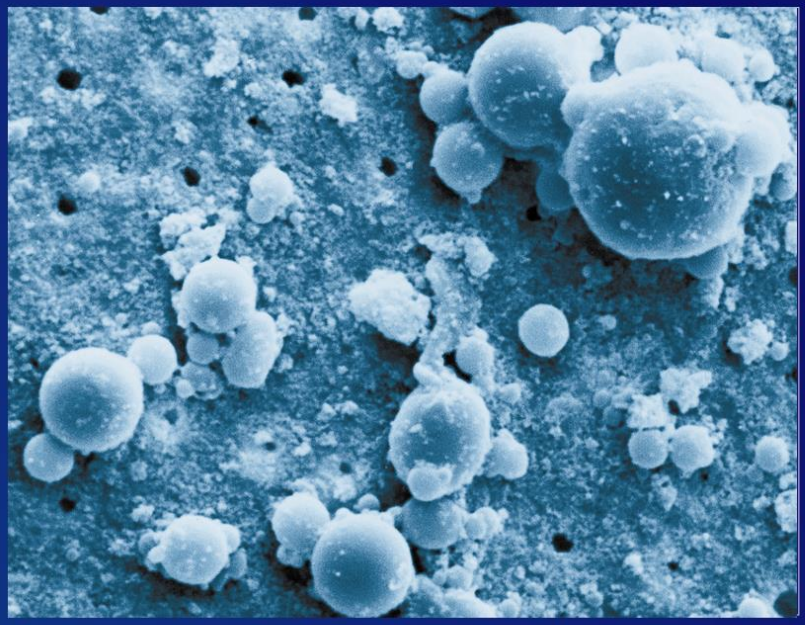
Abrasion

Wedge-shaped defects after mechanical abrasion of the soft dentine

SEM observations after application of elmex® sensitive on dentine



Open dentine tubules (control)



Coverage of dentine tubules after application of elmex® sensitive toothpaste

N. Mordan et al. (2000)