

Nascholingsavond
Praktijk voor Parodontologie
Nijmegen
12 oktober 2011

**"Het spook dat rondwaart.
Externe cervicale wortelresorptie
in al haar facetten."**

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&
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K.U. Leuven
Belgium

Tooth tissue

Before we are able to understand the mechanisms of cervical root resorption, we have to study the basic anatomical tooth structures, and the influence of trigger mechanism on these.

The integrity of the cementum is an essential element in ECR pathology

Cemento-enamel junction

enamel
dentine
predentine
odontoblast layer
pulp cavity

gingival sulcus
gingival periodontal fibers
gingival epithelium
acellular cementum
periodontal ligament
cellular cementum
alveolar bone
root canal
apical foramen

Andreasen & Andreasen
Dental Traumatology

Cementum is a dentine protective factor

Cemento-Enamel Junction
Schroeder & Scherle
J. Period. Res. 1988, 23, p. 56

Types of root tissue relationship at CEJ

a. Edge to edge contact, 49%

b. Overlap of enamel by cementum, 33%

c. Gap between enamel and cementum with exposed dentine, 18%

d. (b+c) Side by side

Enamel
Dentine
Cementum

Langford
Am. J. Orthod. 1982, vol 81, p. 374

- Periodontal ligament (P)
- Acellular Cementum (AC)
- Repair by Cellular Cementum (CC)
- Resorption lacunae (H)

Langford
Am. J. Orthod. 1982, vol 81, p. 373

- Acellular Cementum (AC)
- Resorption lacunae (H)
- Repair by Cellular Cementum (CC)

D
CC
P
AC
H
CC

Transient surface resorption

Langford S.R.
Root resorption extremes resulting from clinical rapid maxillary expansion
Am. J. Orthod. 1982, vol. 81 p. 371-377

Andreasen & Andreasen
Dental Traumatology

Bacterial contamination & Inflammatory resorption

200 µm

Orthodontic treatment

Cementum is a dentine protective factor

The PRRS (pericanalar resorption resistant sheet) including predentine is a pulpcanal protective layer

PRRS

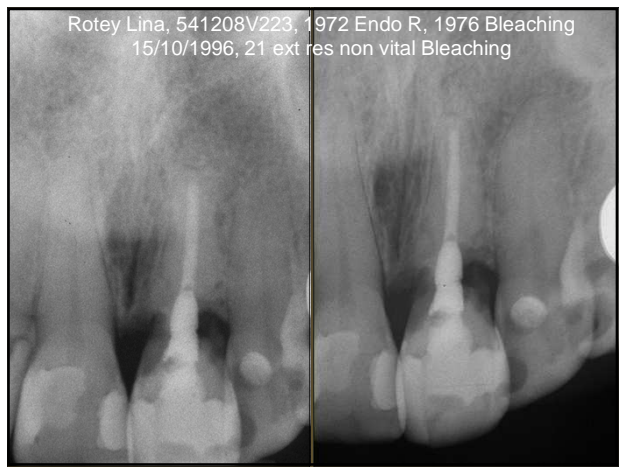
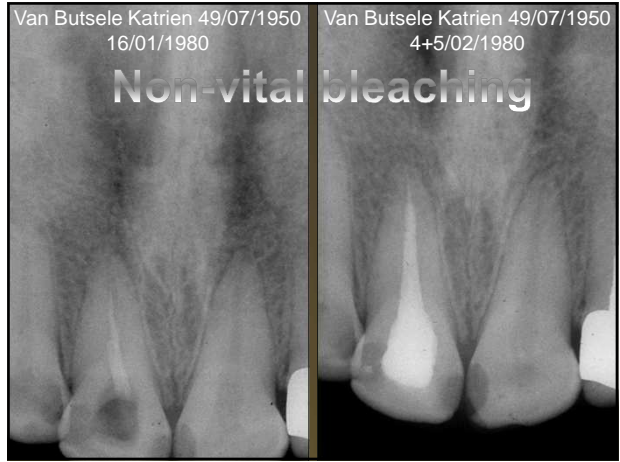
Osseo-dentine can partially replace the resorption defects

Osseo-dentine

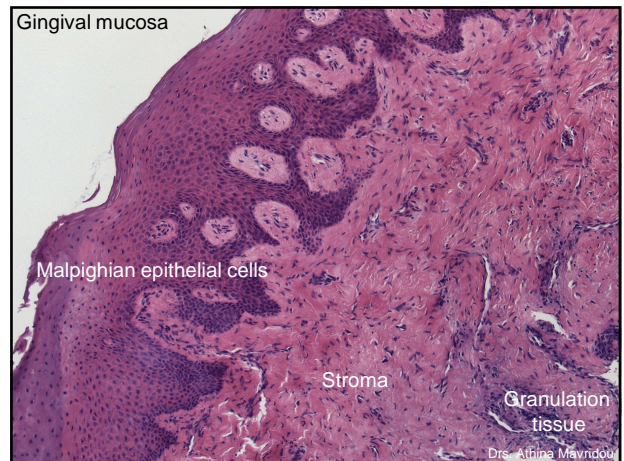
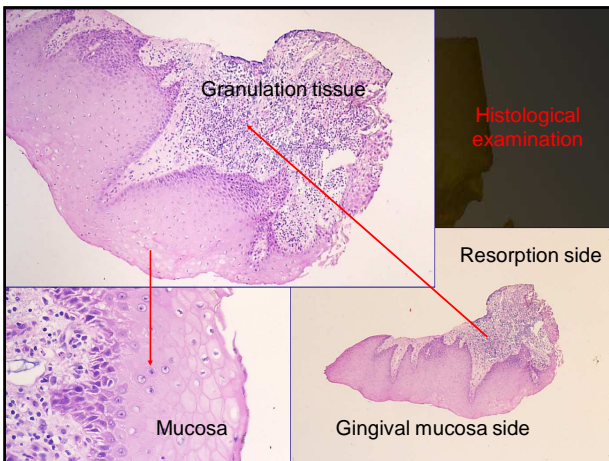
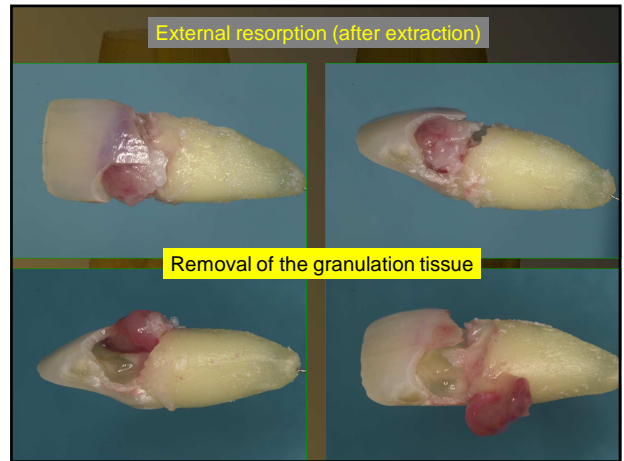
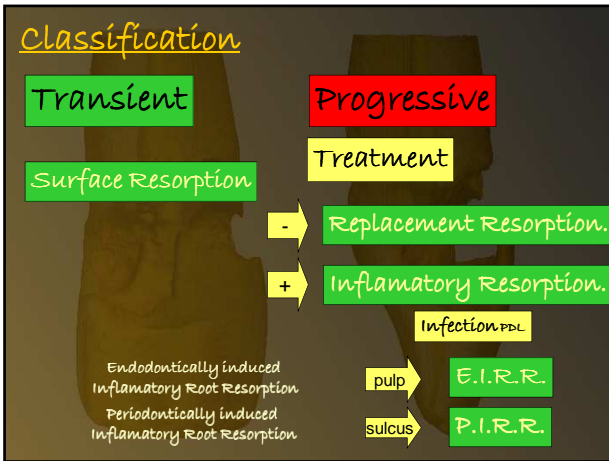
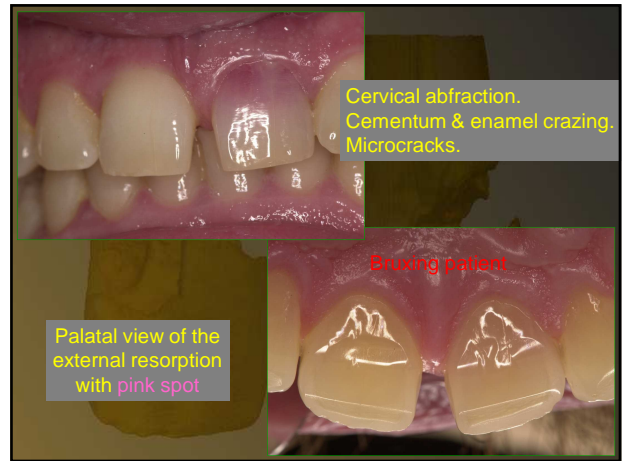
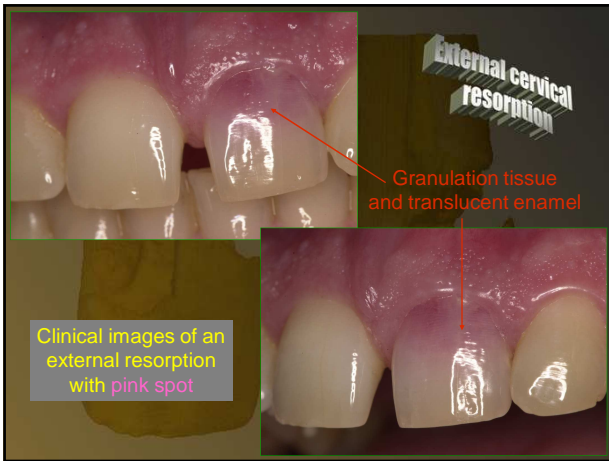
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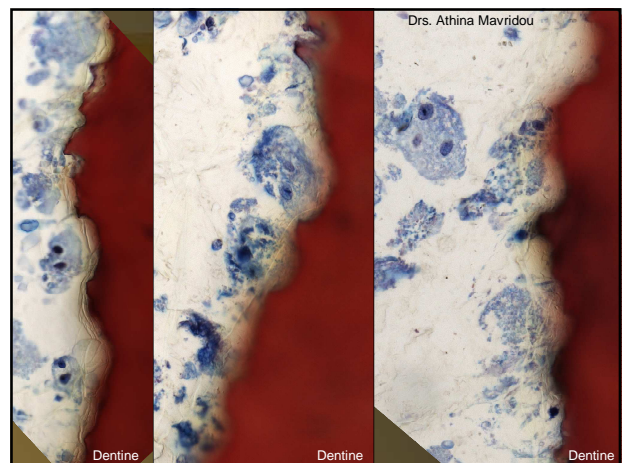
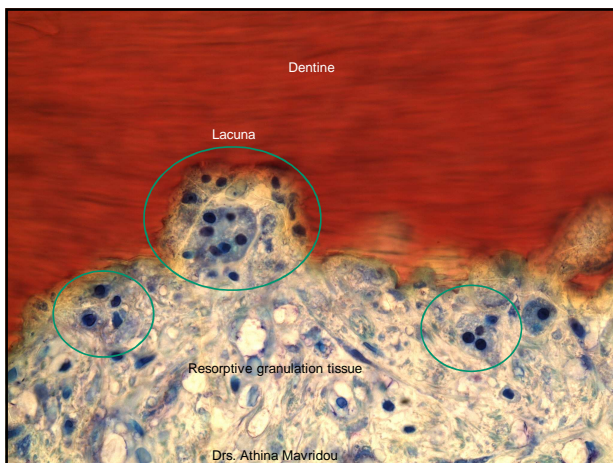
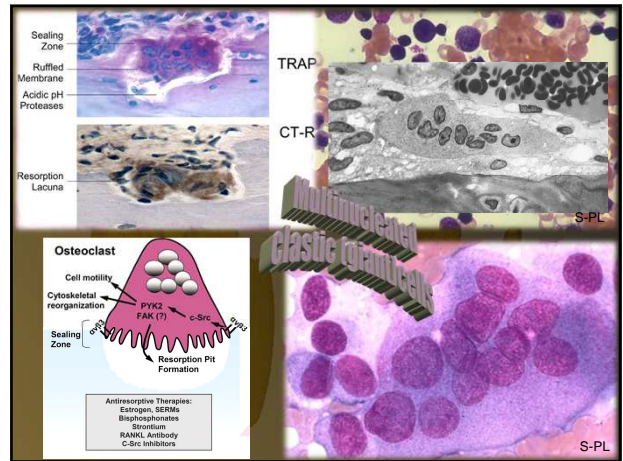
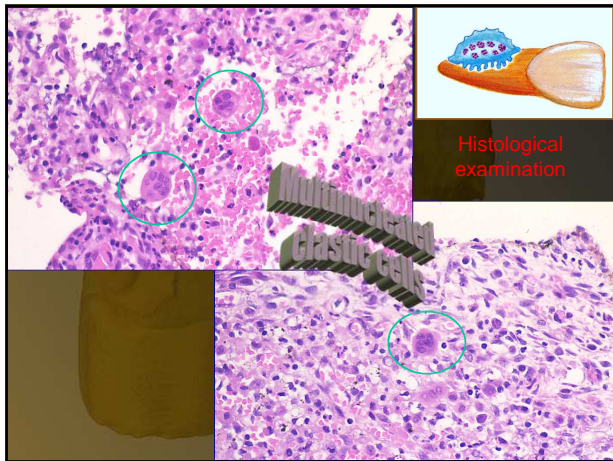
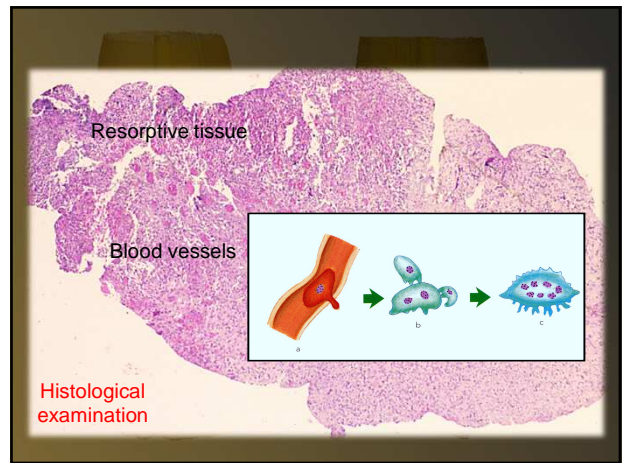
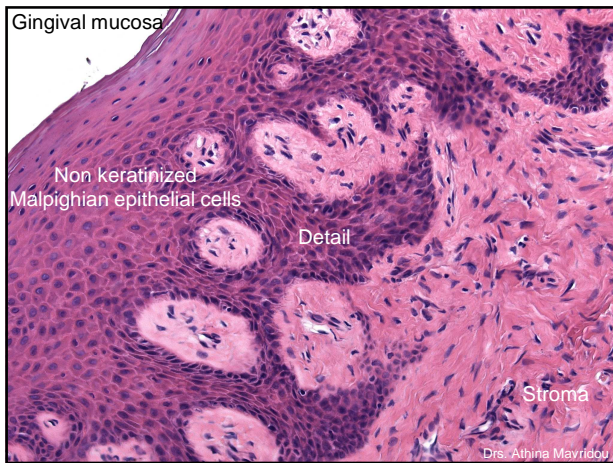
1000 µm

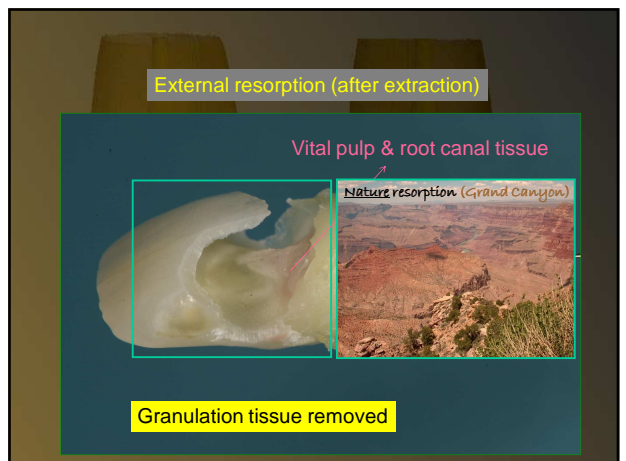
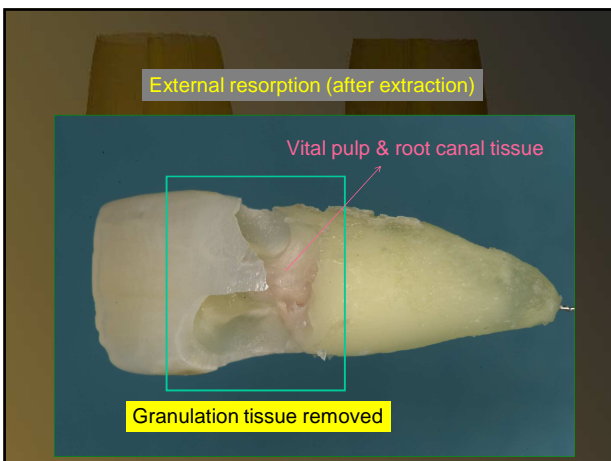
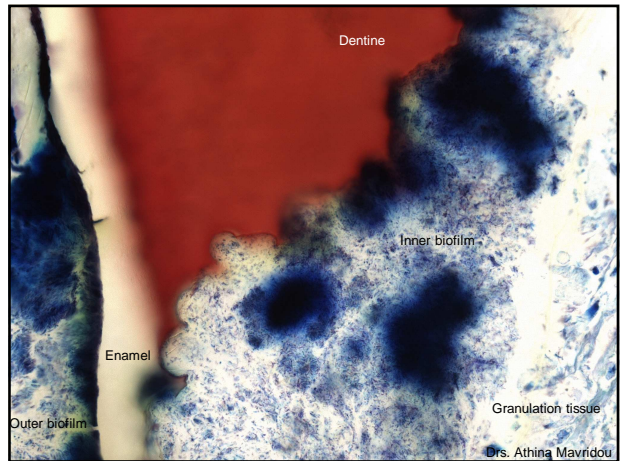
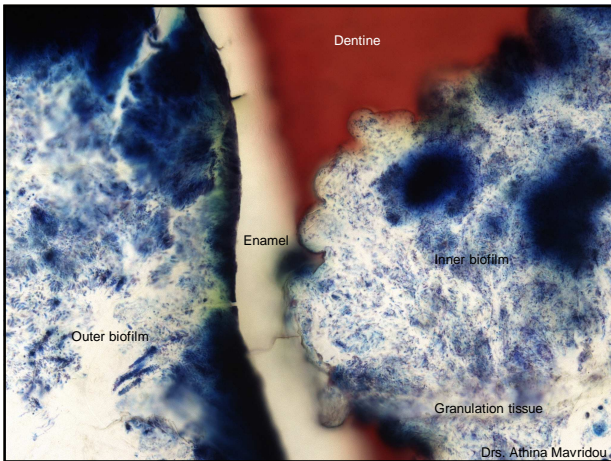
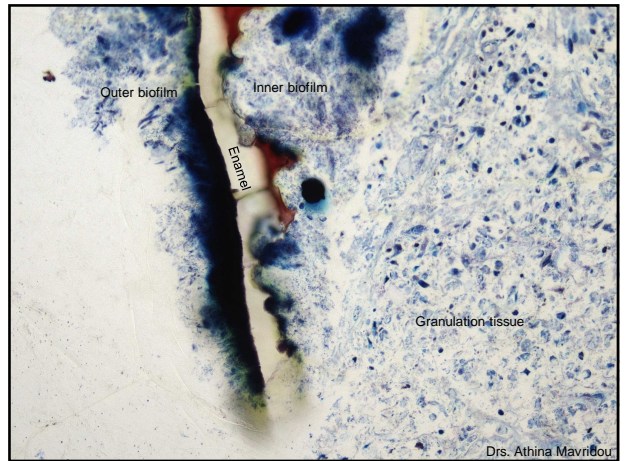
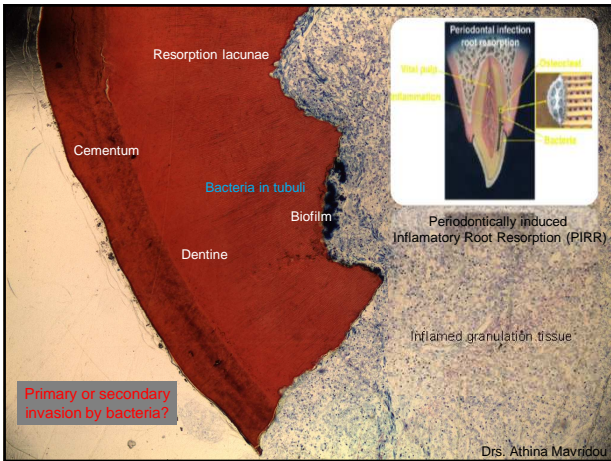
Fronttooth. Bleaching

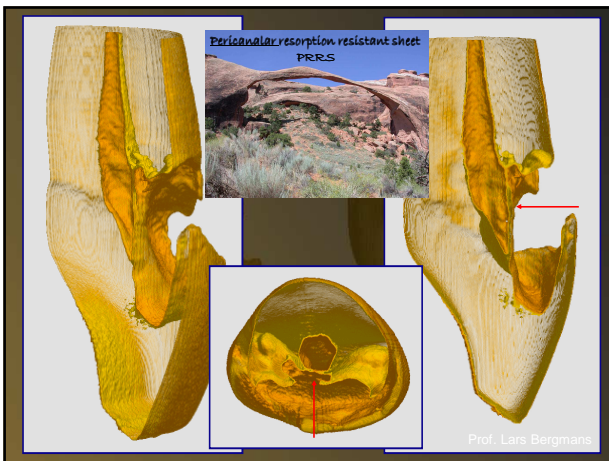
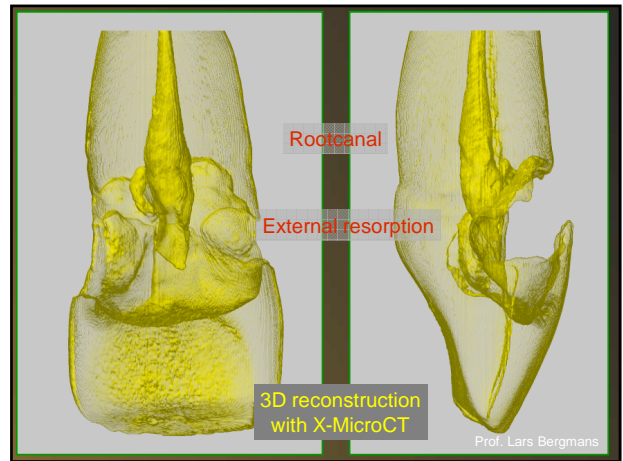
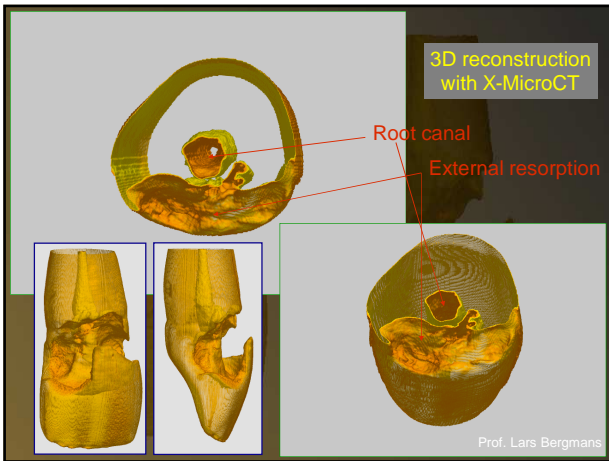
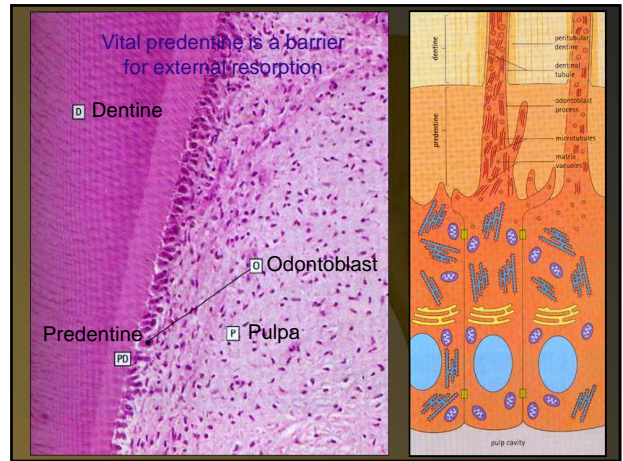
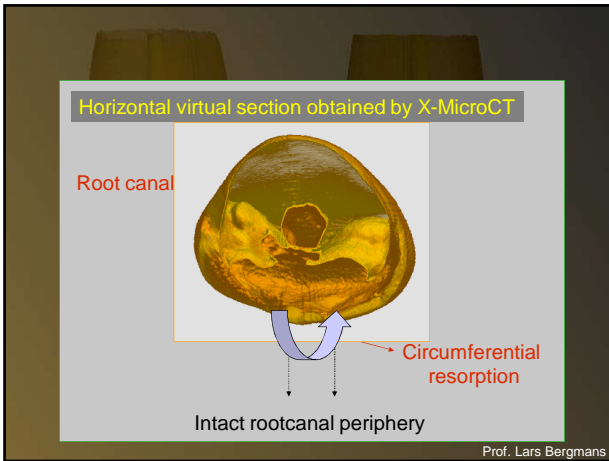


Fronttooth. Bruxism Extraction X-MicroCT

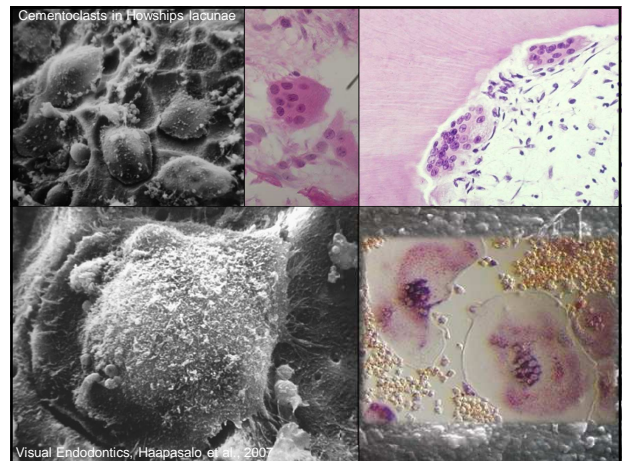
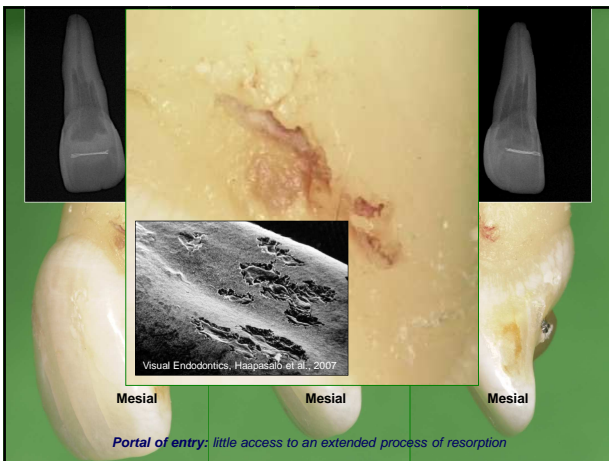
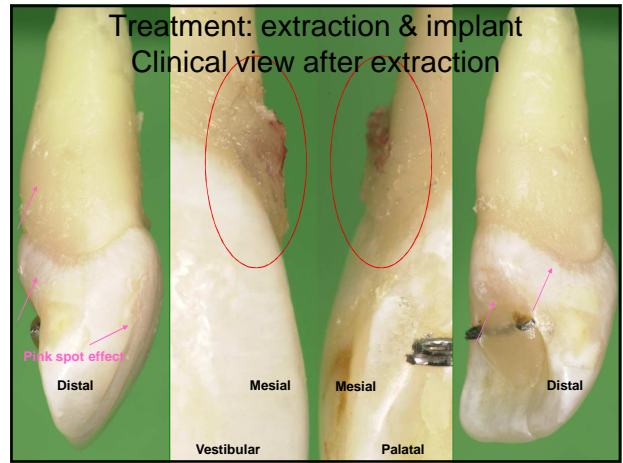
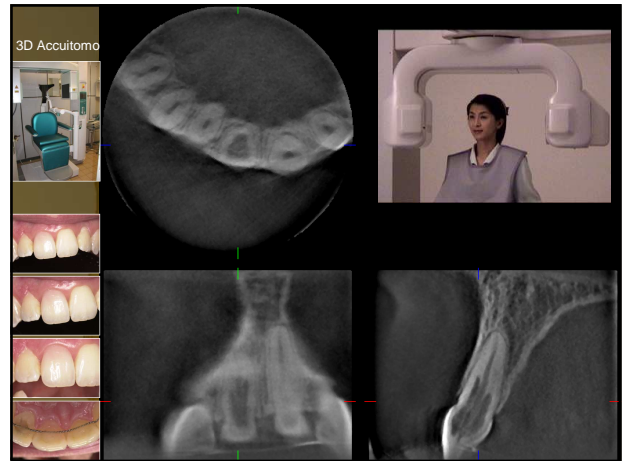
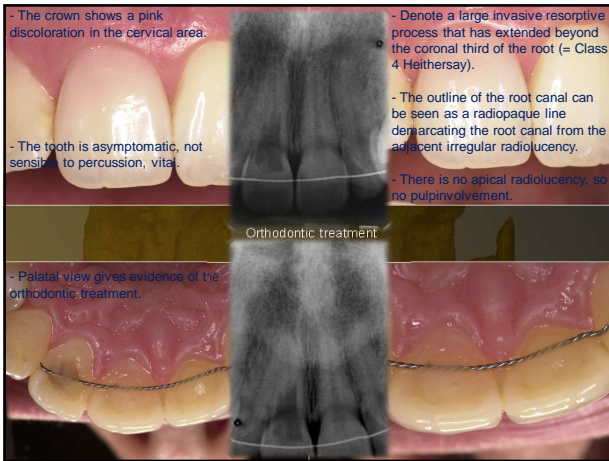


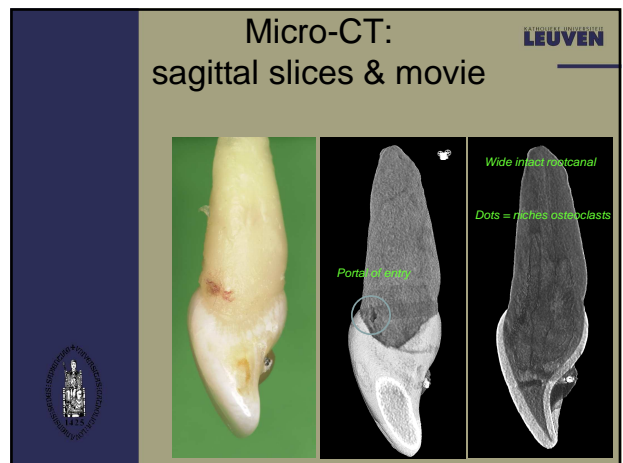
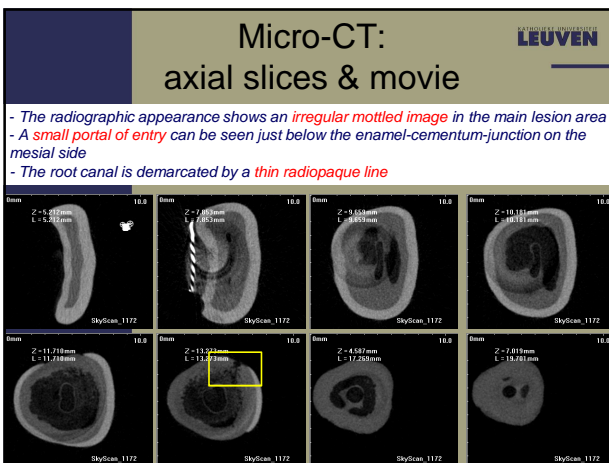
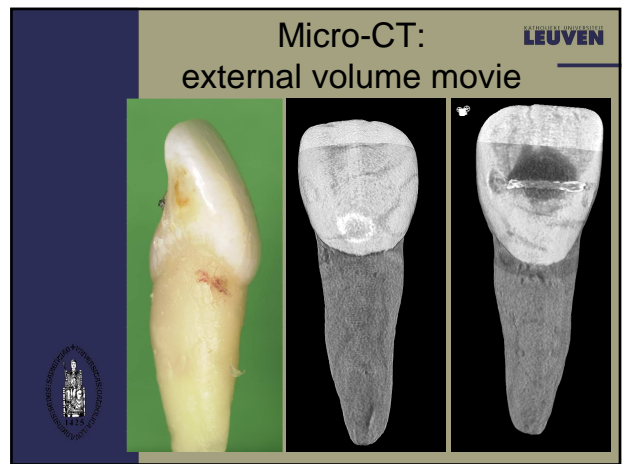
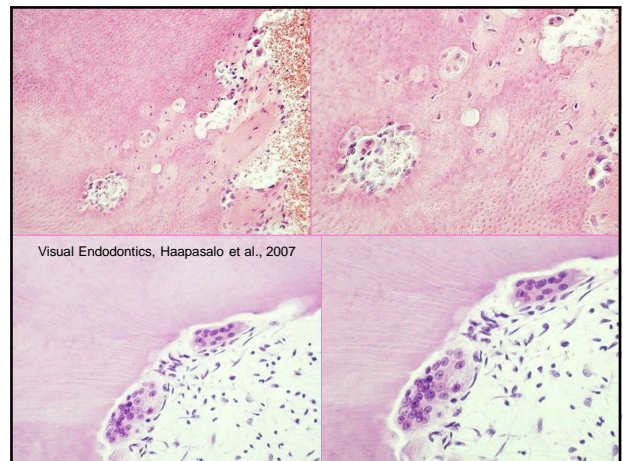
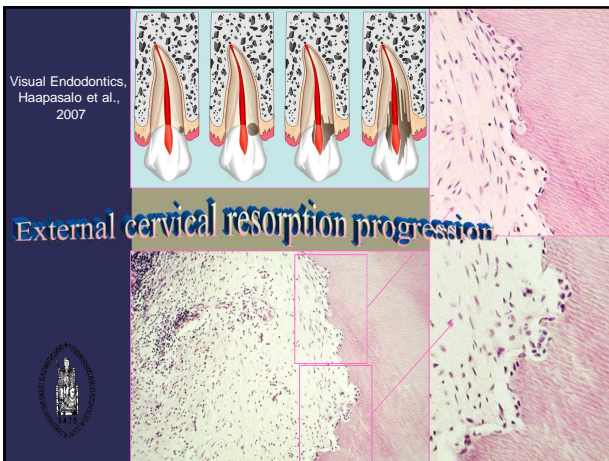


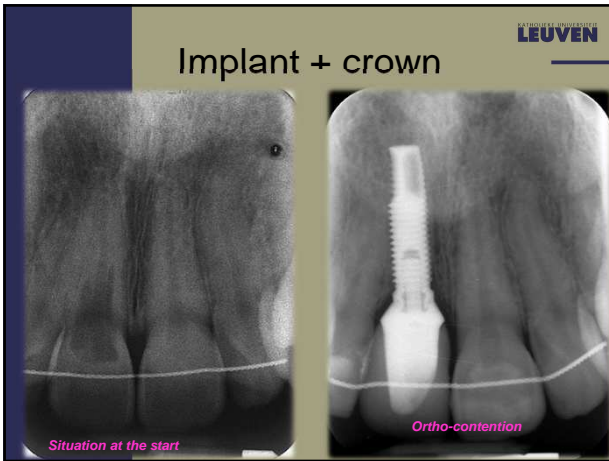




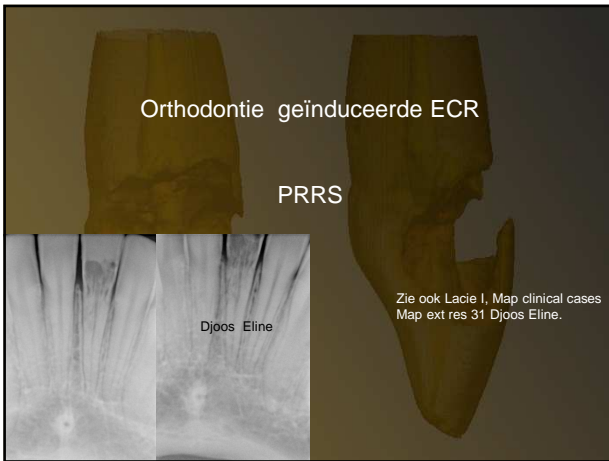
Fronttooth.
Orthodontie
Extractie
X-MicroCT



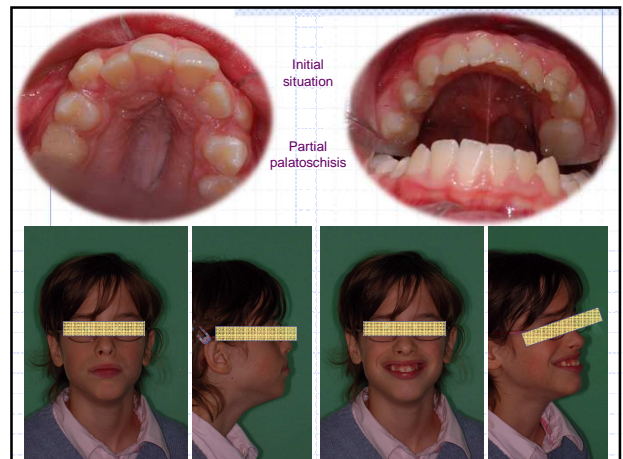


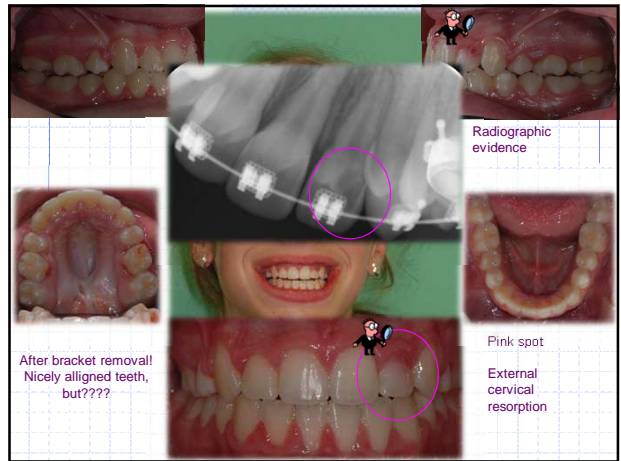
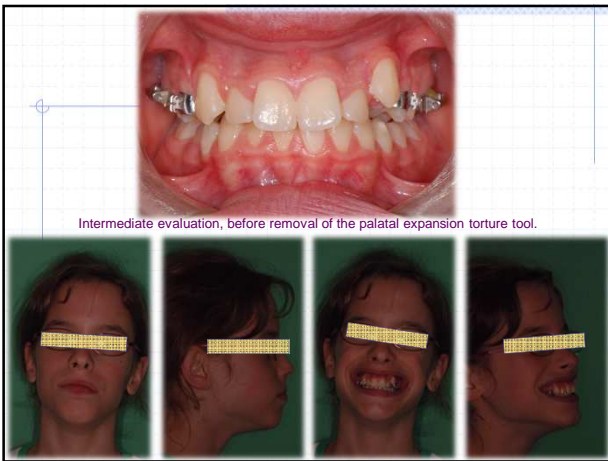
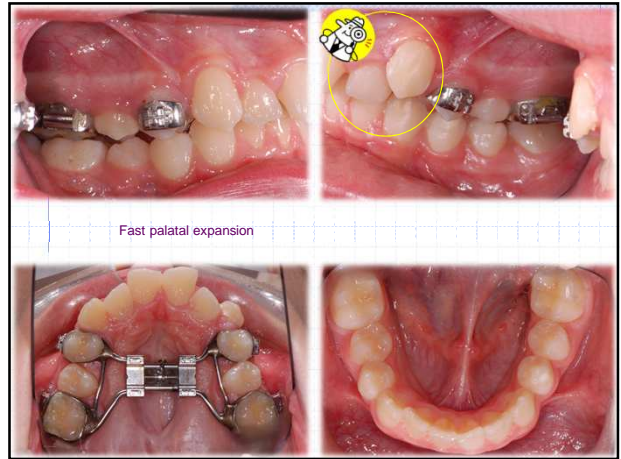


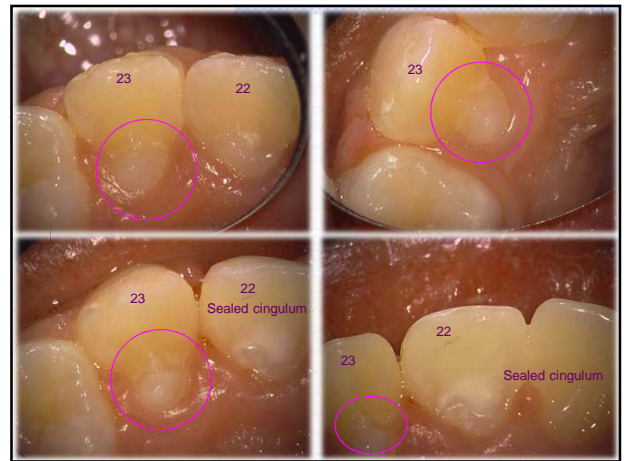
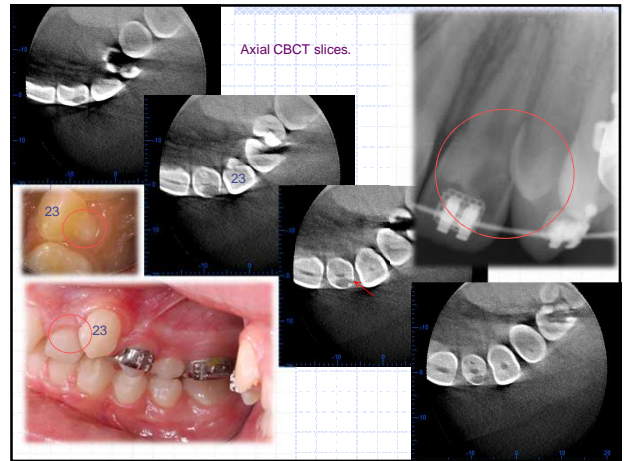
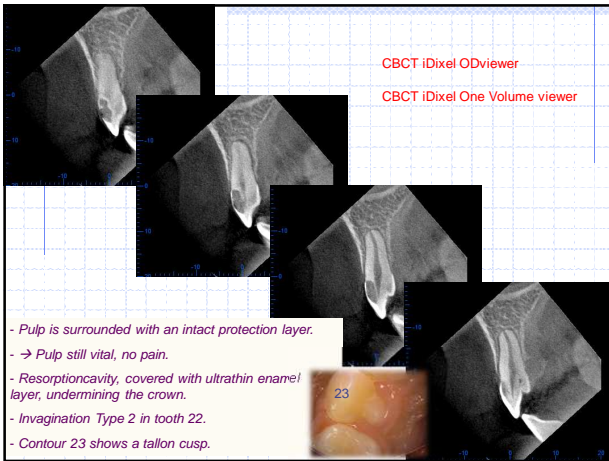
Fronttooth.
Orthodontics
PCRRS
Extraction

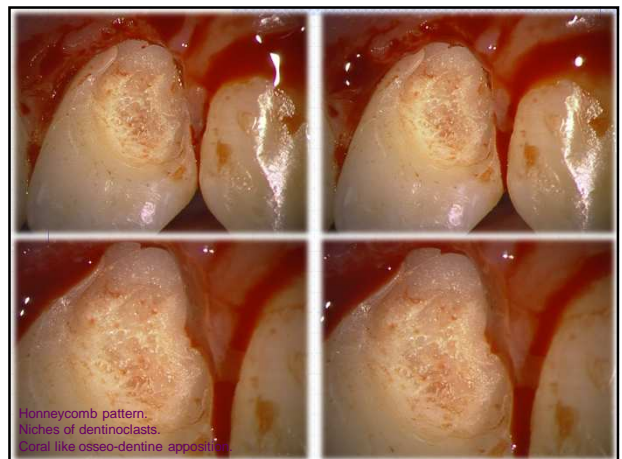
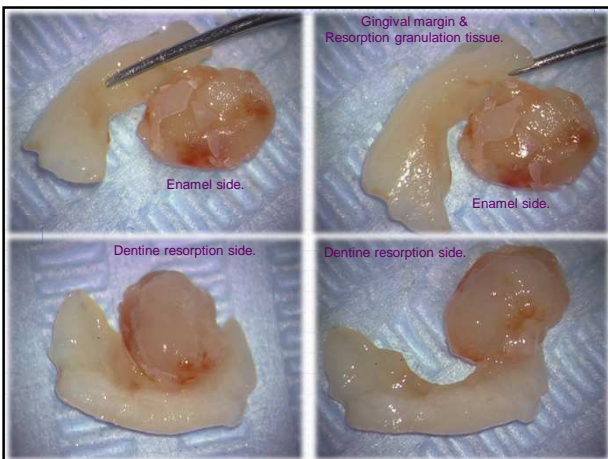
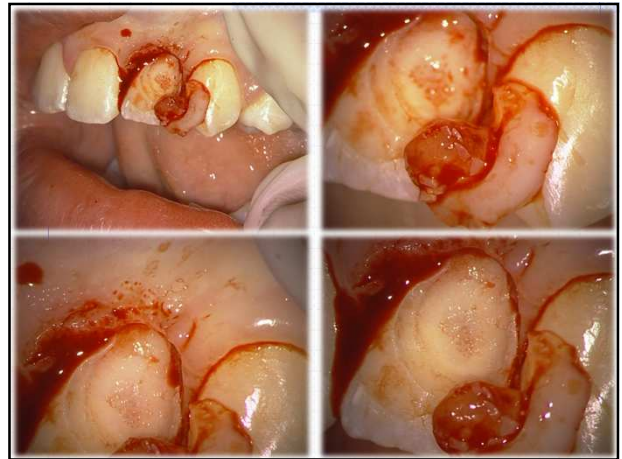
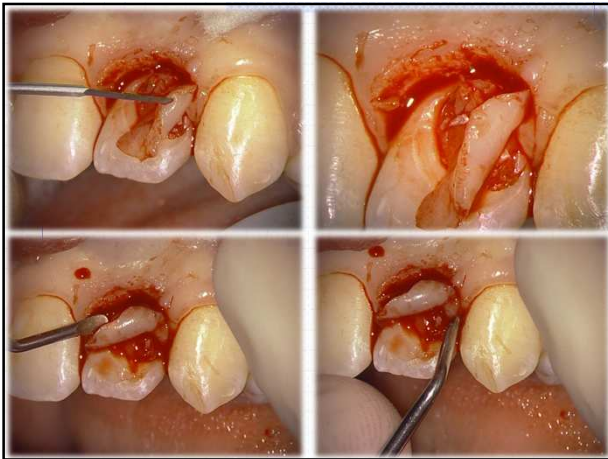
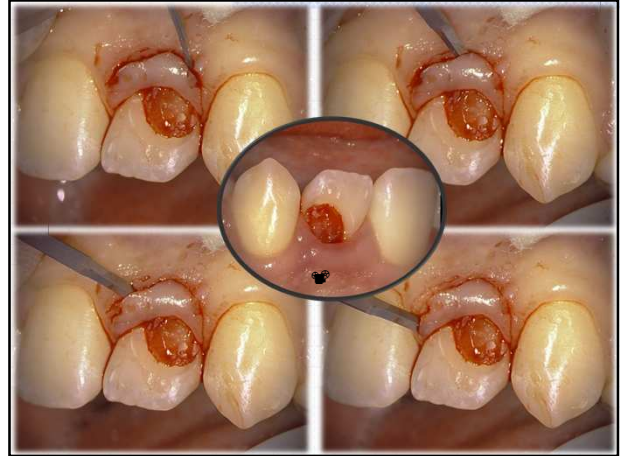
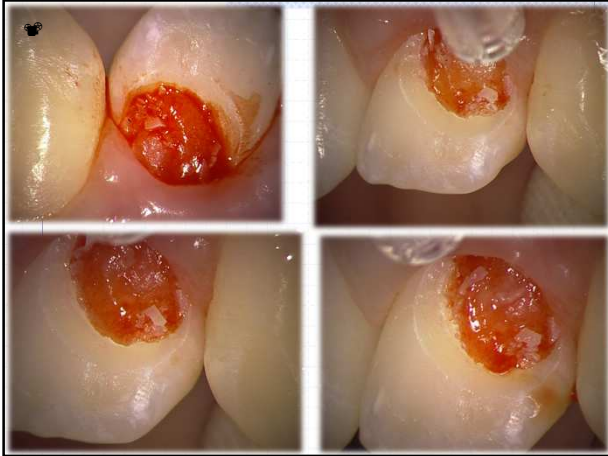


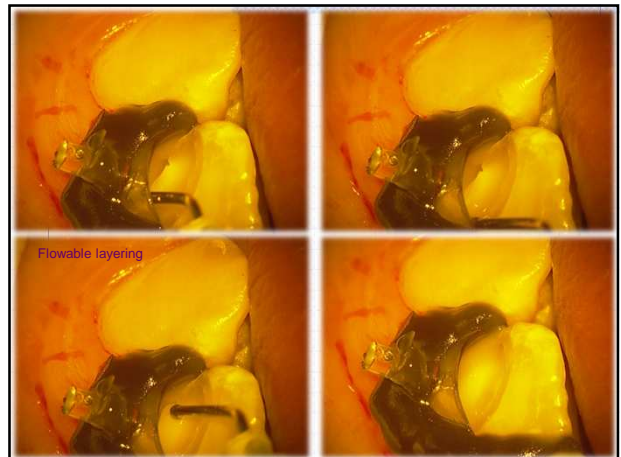
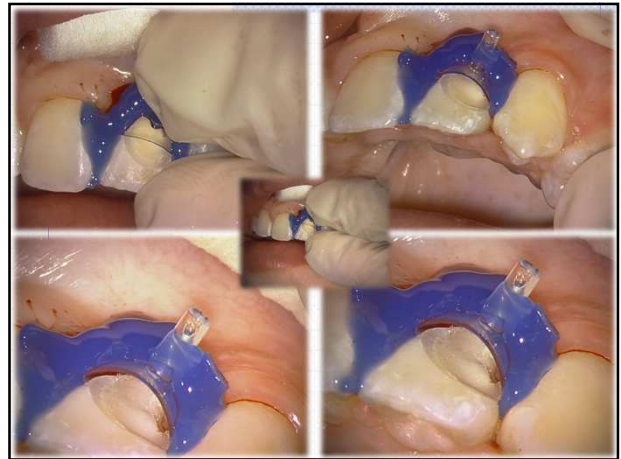
Fronttooth.
Orthodontics
Keep vital

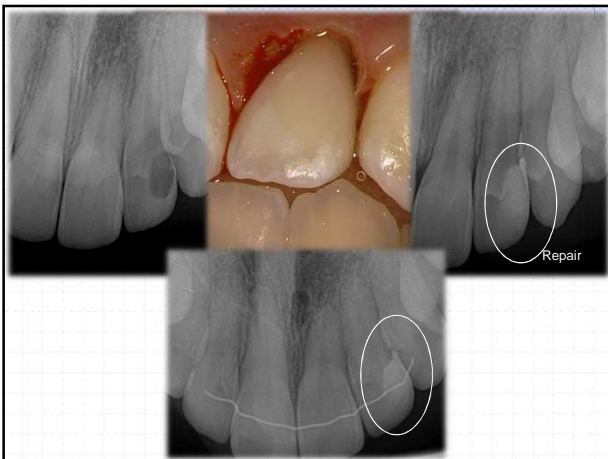
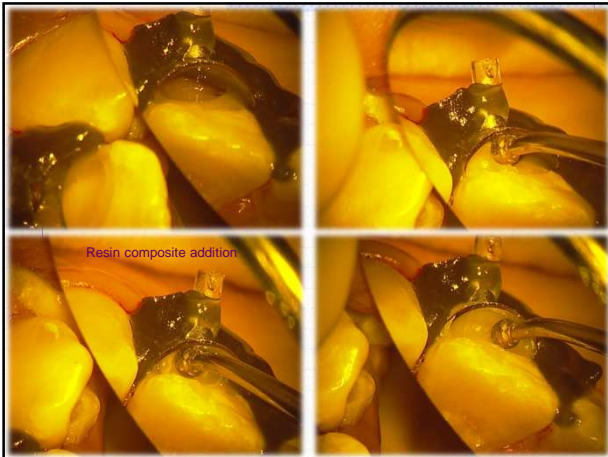


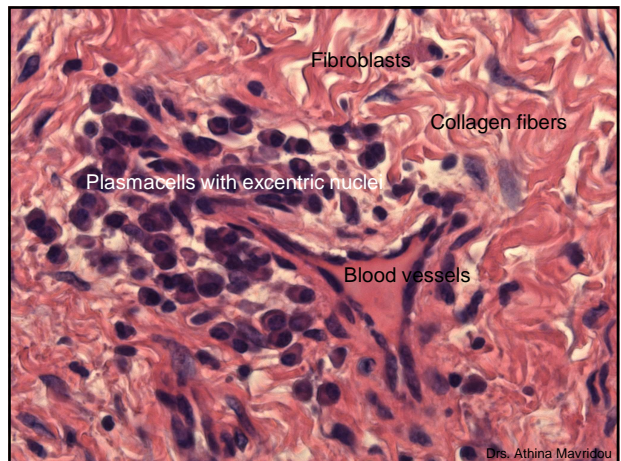
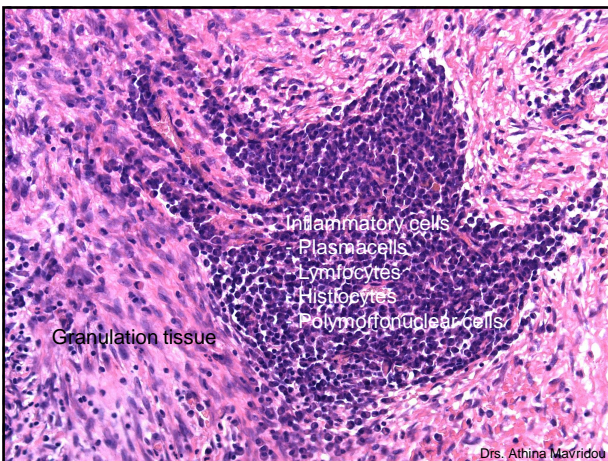
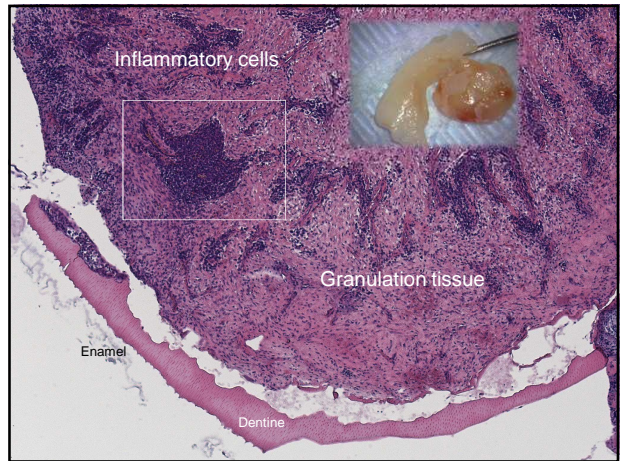


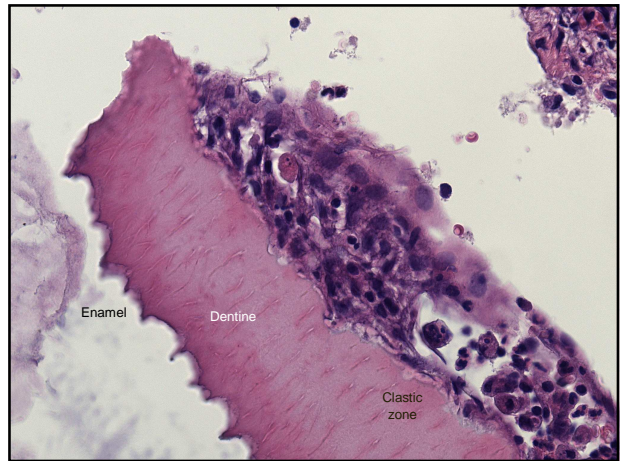
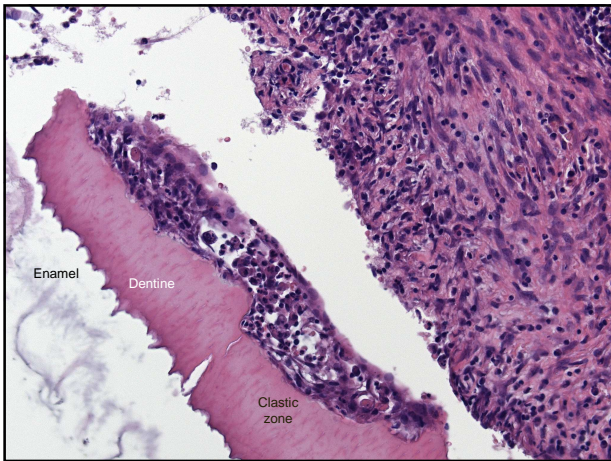












Fronttooth.
Musicinstruments
Trumpet
Waifull watching



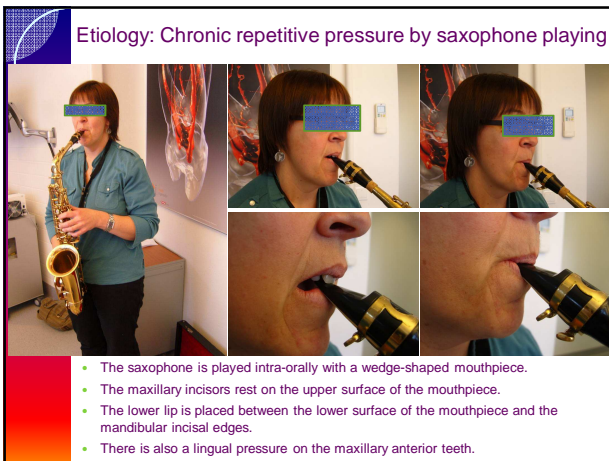
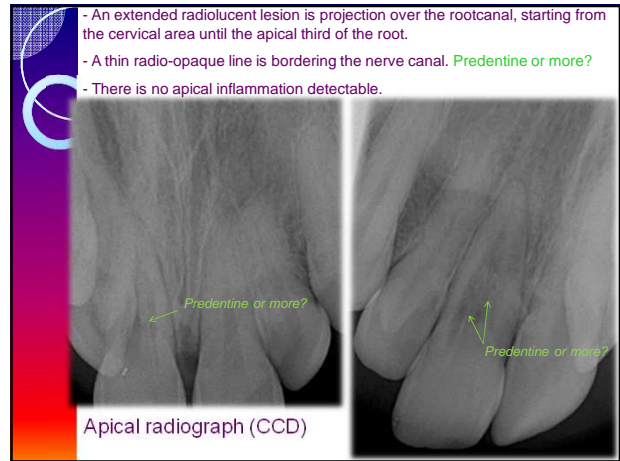
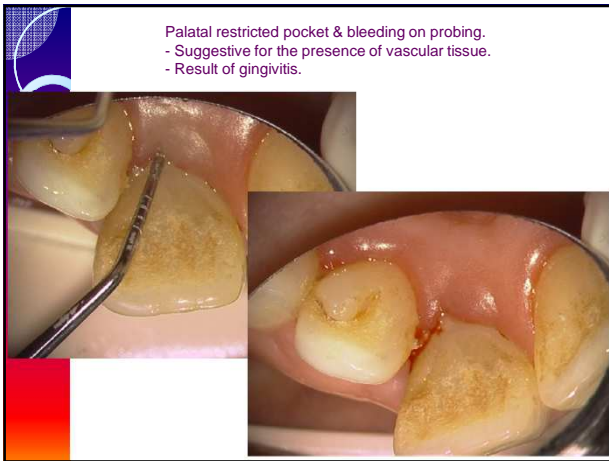
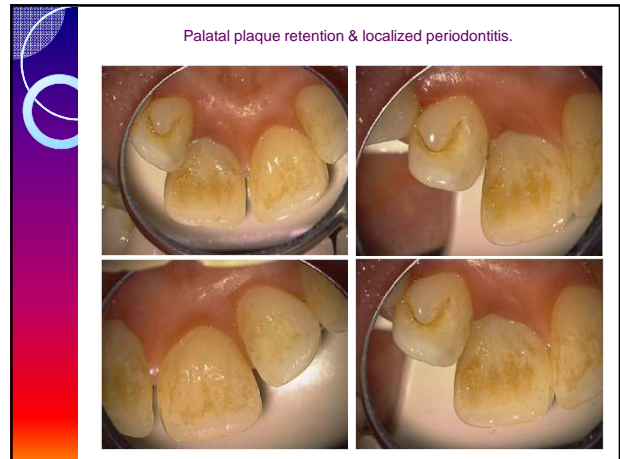


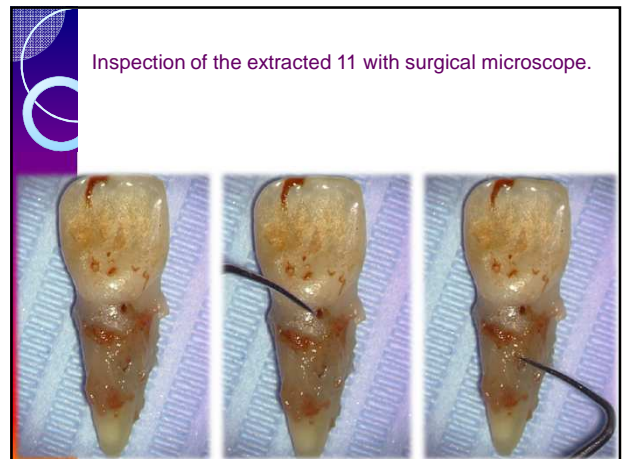
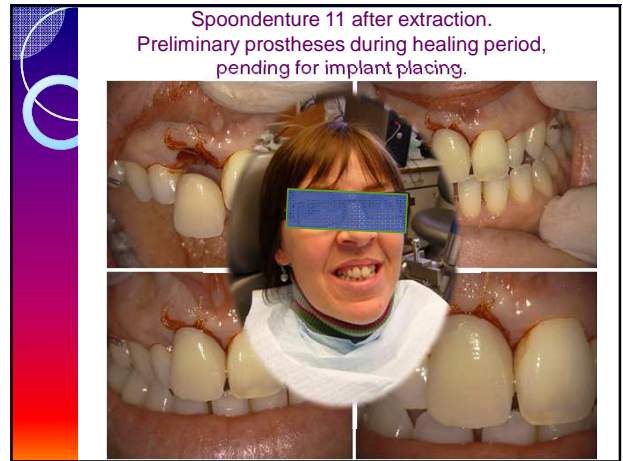
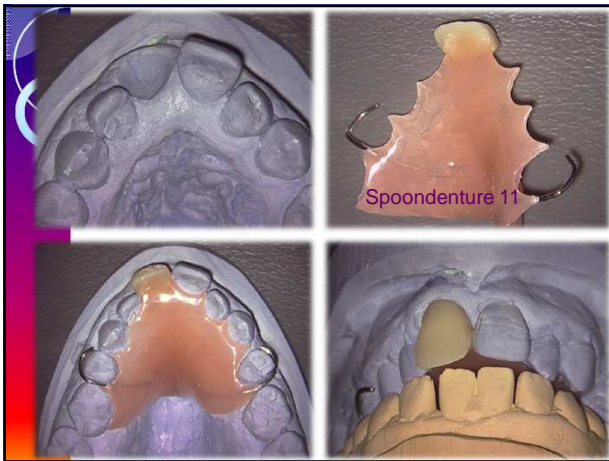
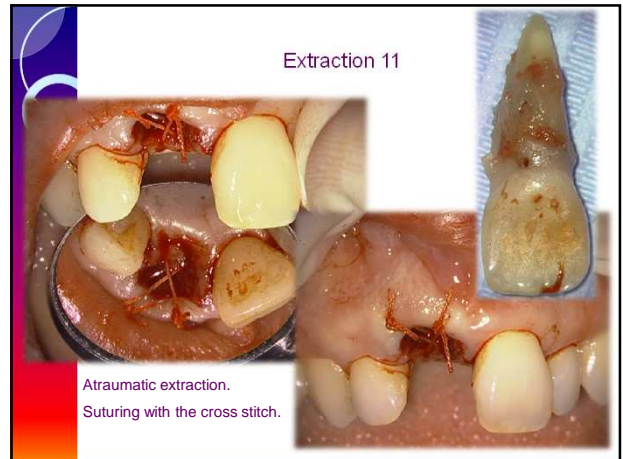
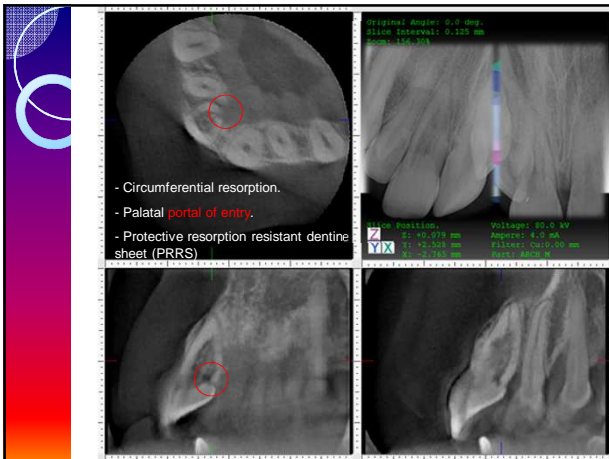
- Tongue pressure against frontteeth.
- Repetitive Trumpet/Lip pressure for long periods during several years.
- Tilting moment cervical fulcrum.
- Orthodontic treatment at youghtime which induced initial cementum damage.
- Activation of osteoclast + -blastocylus for dentin resorption and new formation of osseodentin.
- Plaque: maintaining periradicular inflammation.
- Hypoxia: stimulus for the formation of osseodentin.

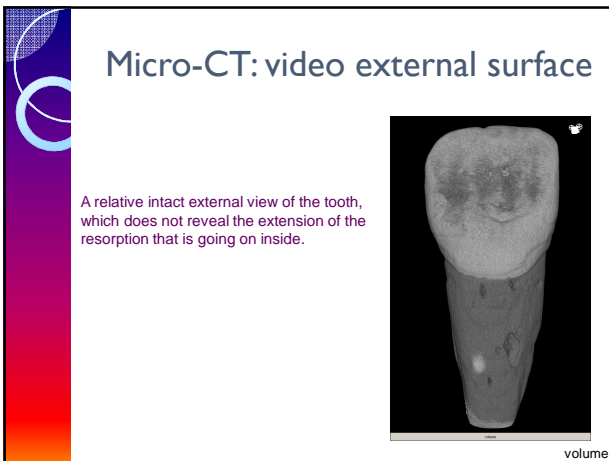
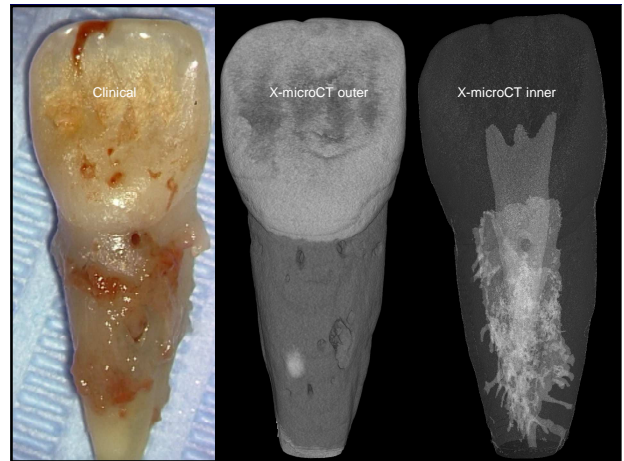
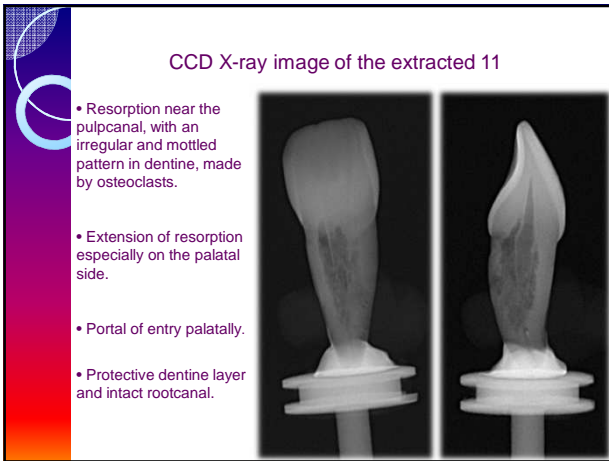
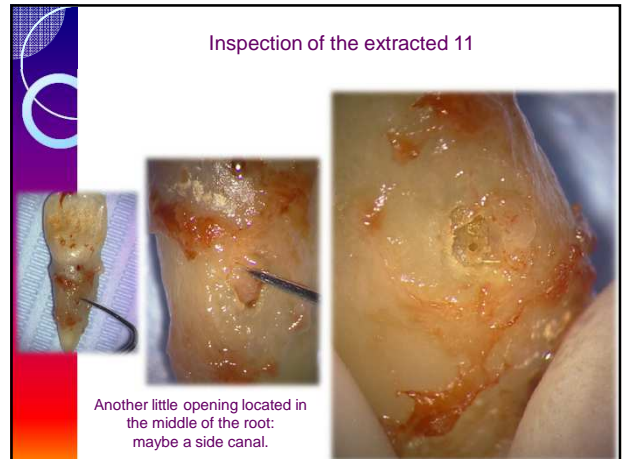
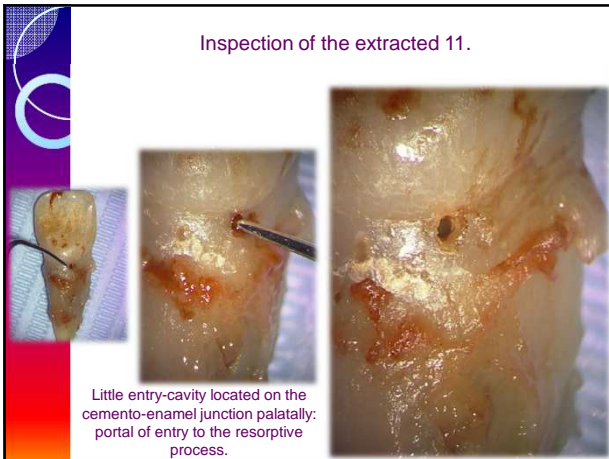


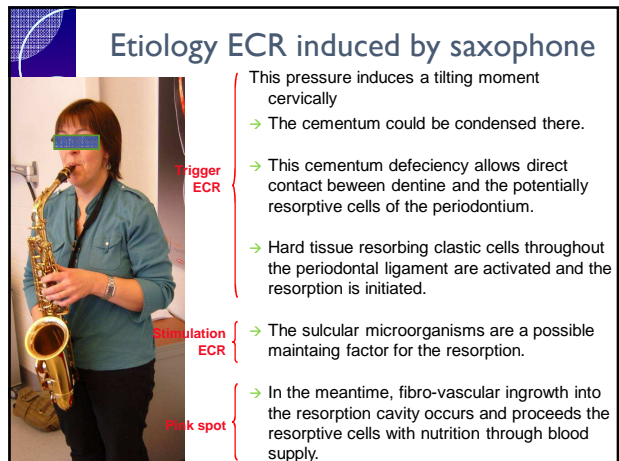
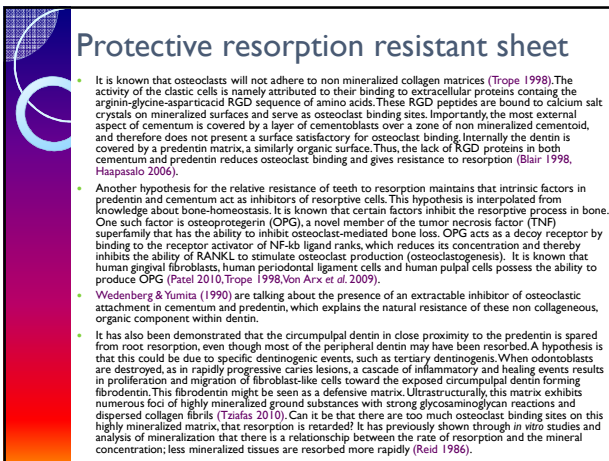
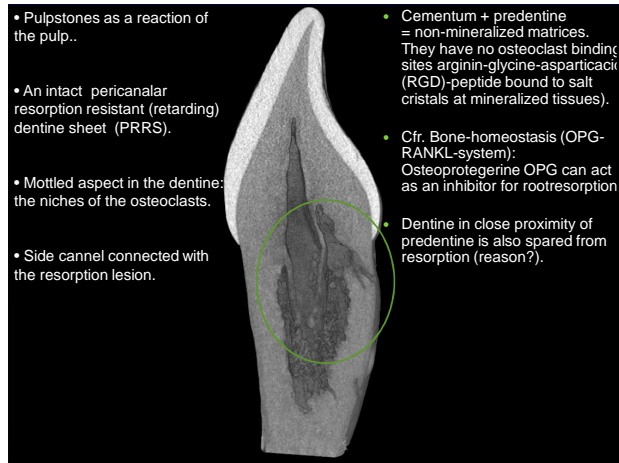
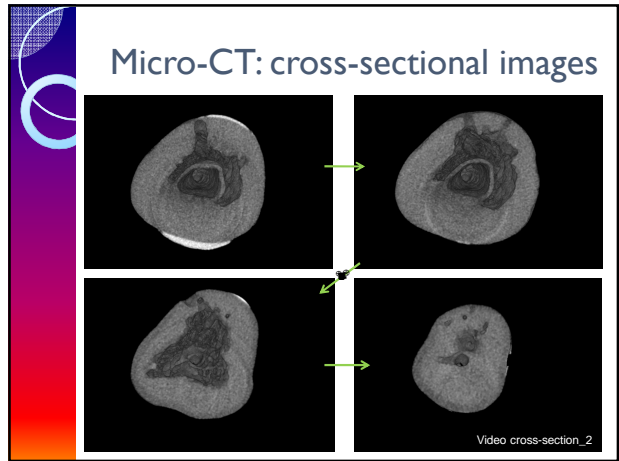
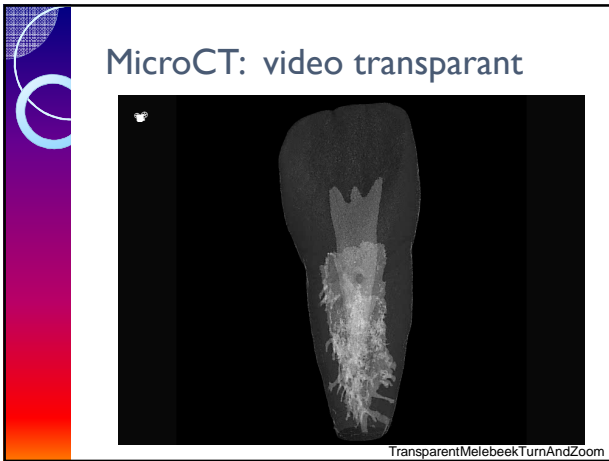
Fronttooth. Musicinstruments Extraction X-MicroCT

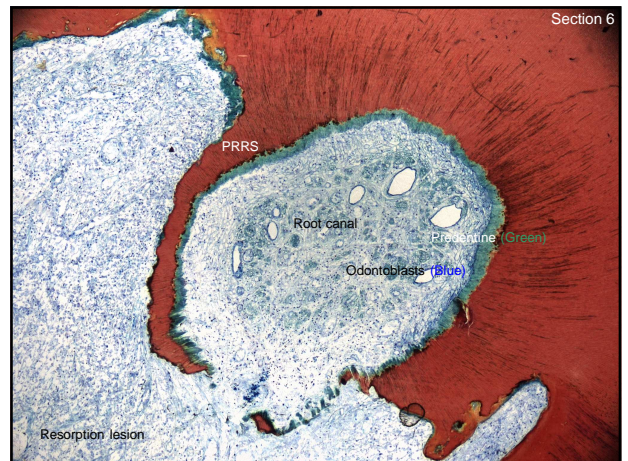
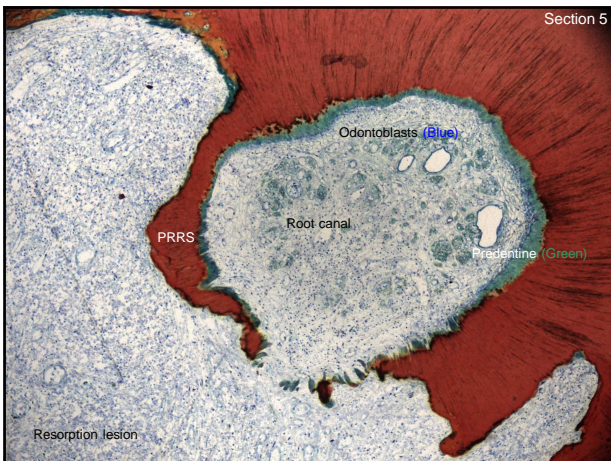
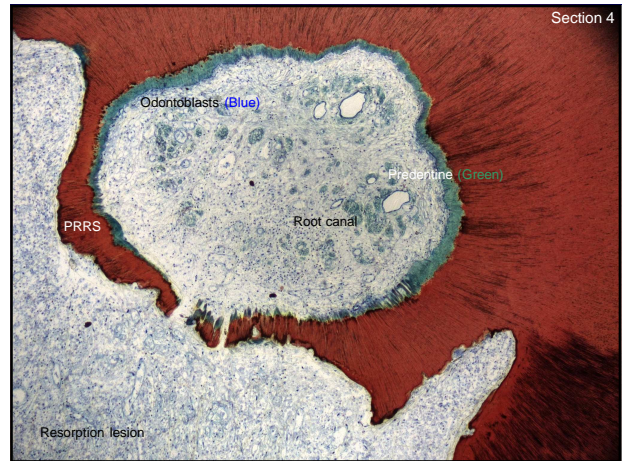
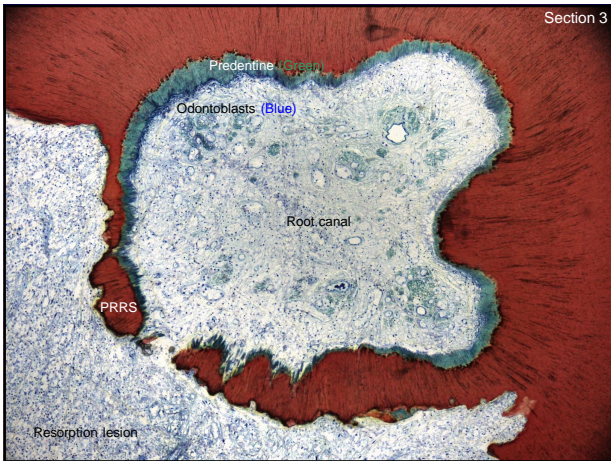
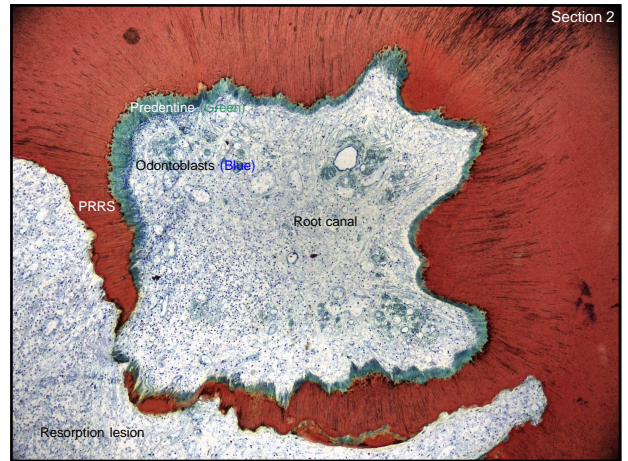
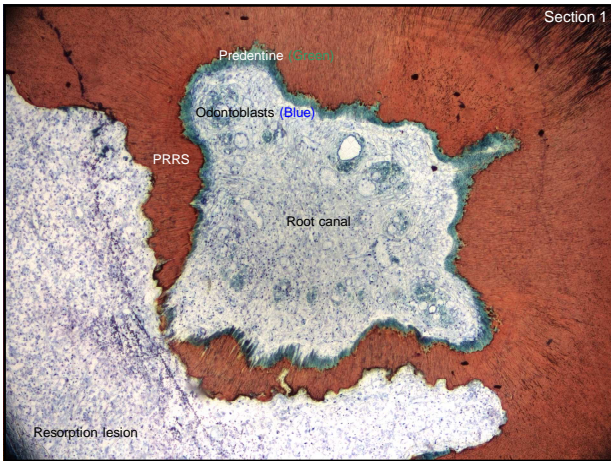


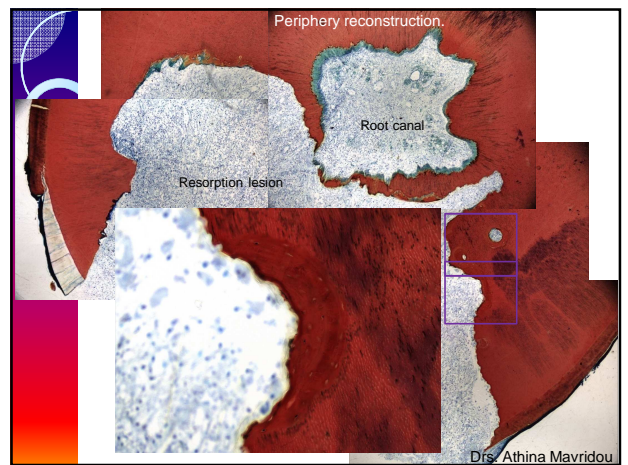
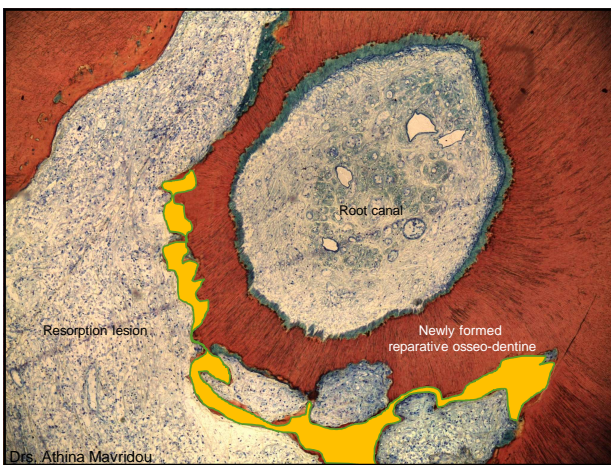
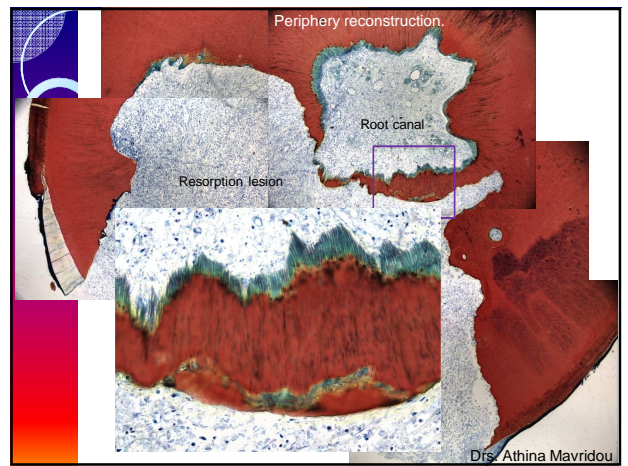
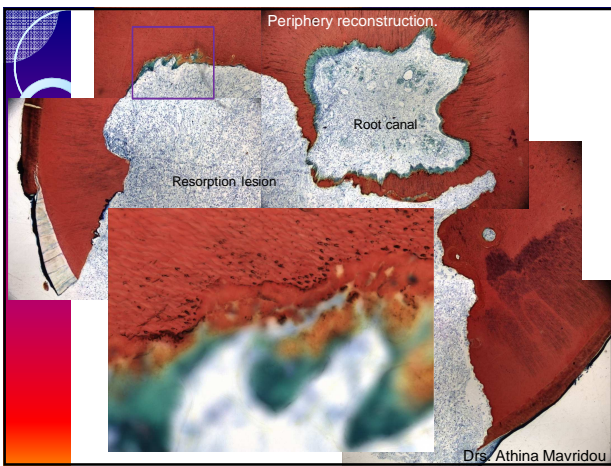
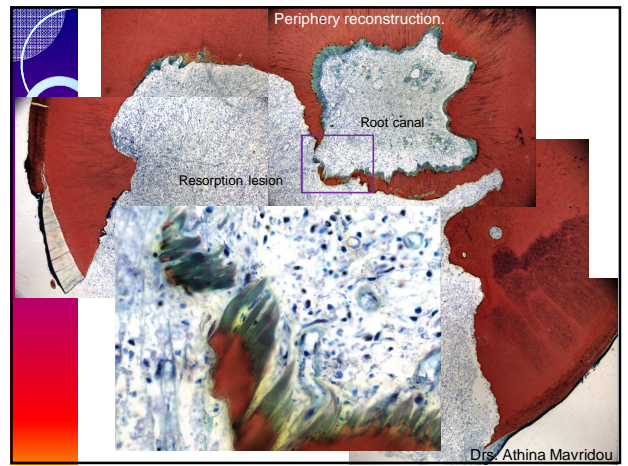
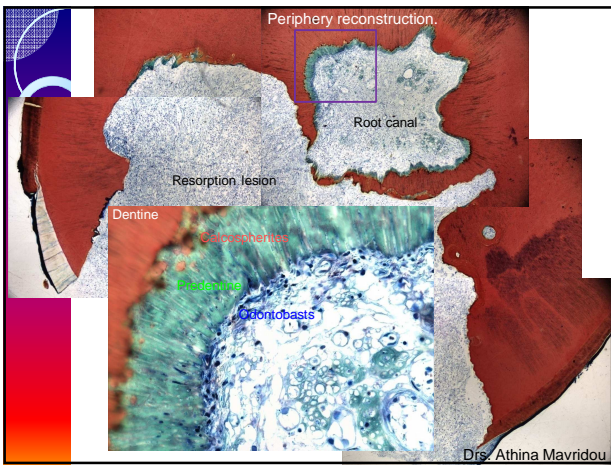












Premolar. Orthodontics Extraction X-MicroCT

Female, 31 years old, in good health

Reason of consultation:

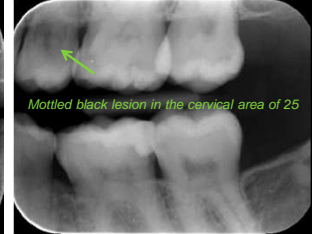
The patient, who is a dentist, discovered coincidentally on a radiograph a strangeness on tooth 25.

Dental anamneses:

No trauma in the past, **orthodontics** 10 years ago

Clinical research:

No symptoms, no pinkspot detectable



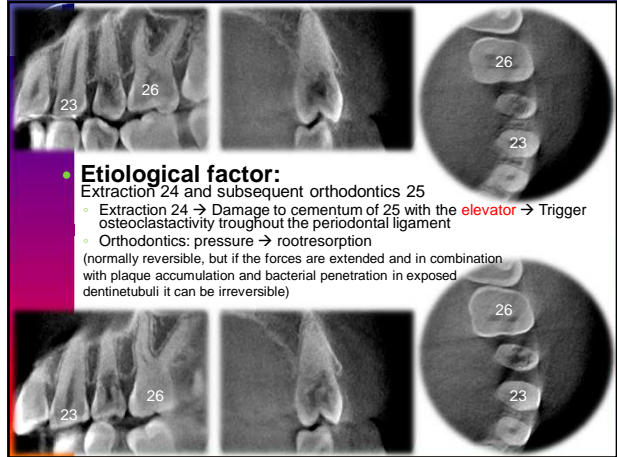
Without careful examination, you can overlook the problem easily.

Orthodontics 10 years ago

- An intact periodontal ligament → no periapical infection

- Not-eaten image with bone-like tissue is projecting over the pulp chamber

- No clearly visible caries



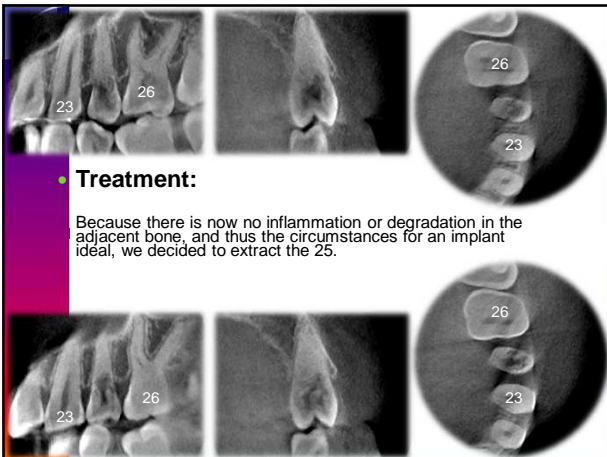
Etiological factor:

Extraction 24 and subsequent orthodontics 25

- Extraction 24 → Damage to cementum of 25 with the **elevator** → Trigger osteoclastactivity throughout the periodontal ligament
- Orthodontics; pressure → rootresorption (normally reversible, but if the forces are extended and in combination with plaque accumulation and bacterial penetration in exposed dentinetubuli it can be irreversible)

Treatment:

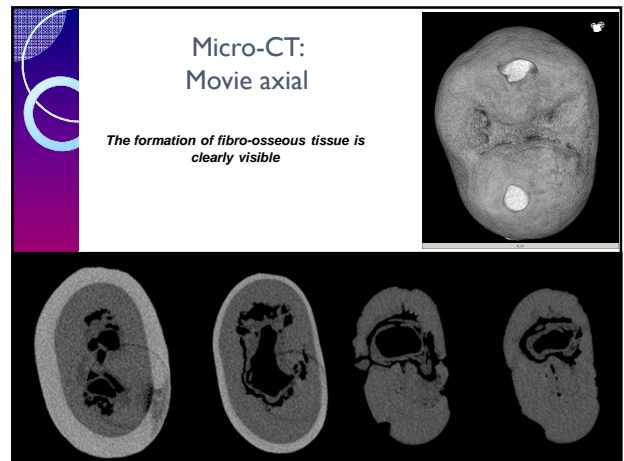
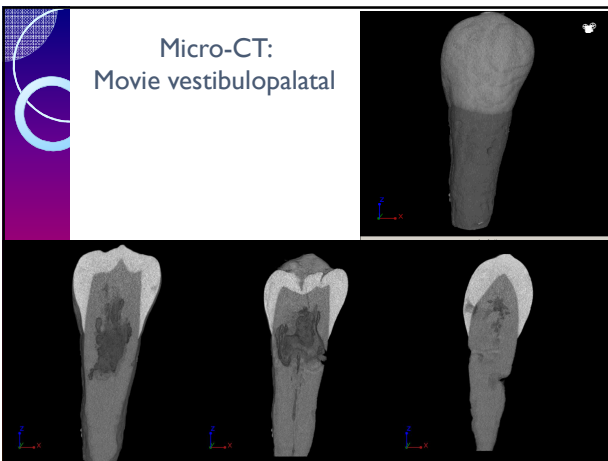
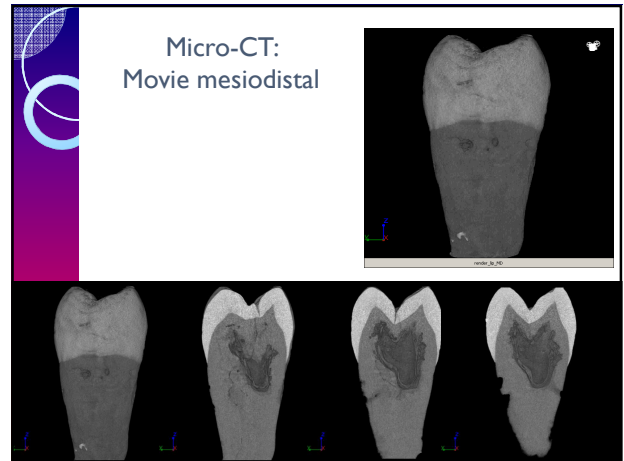
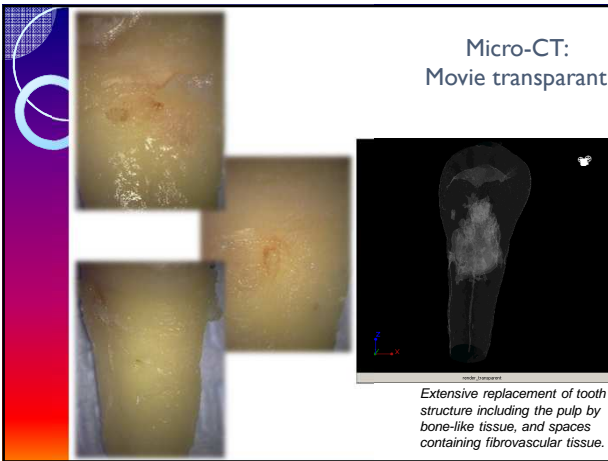
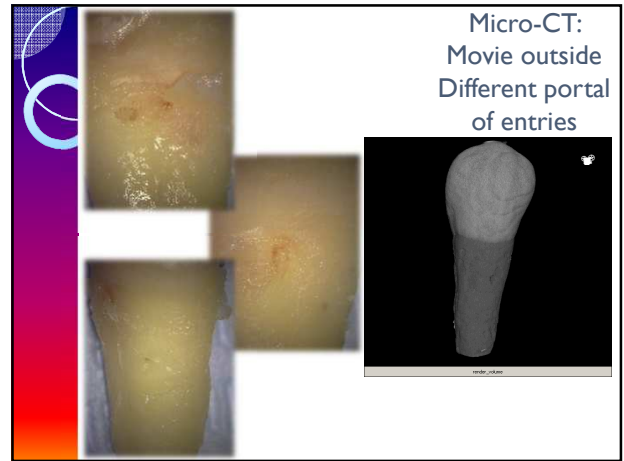
Because there is now no inflammation or degradation in the adjacent bone, and thus the circumstances for an implant ideal, we decided to extract the 25.

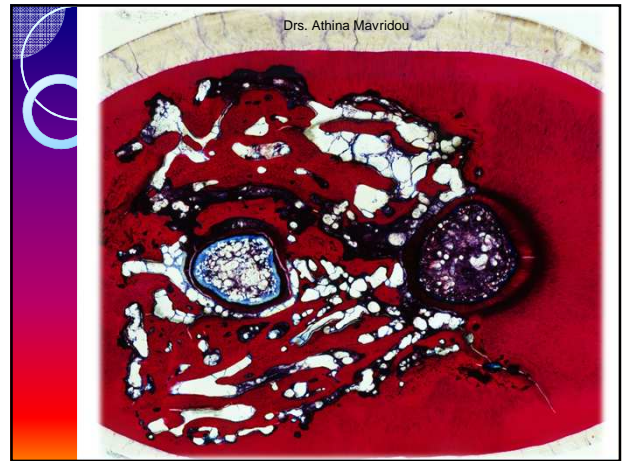
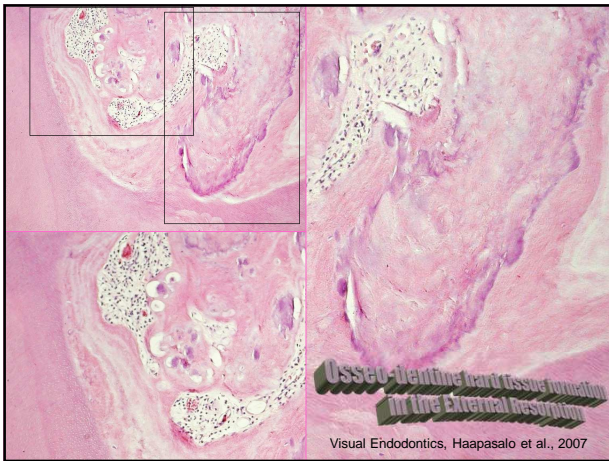


Clinical view after extraction

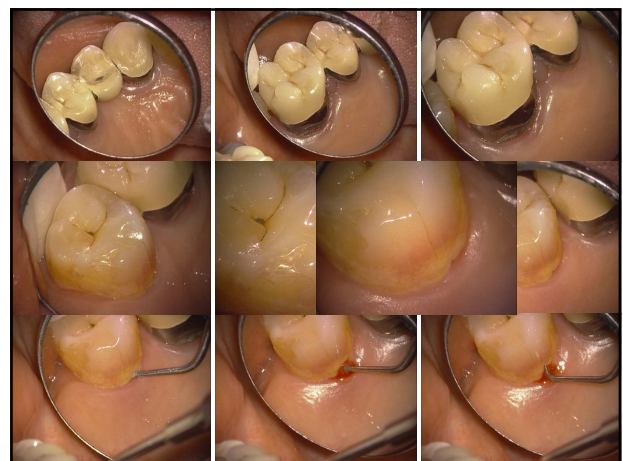
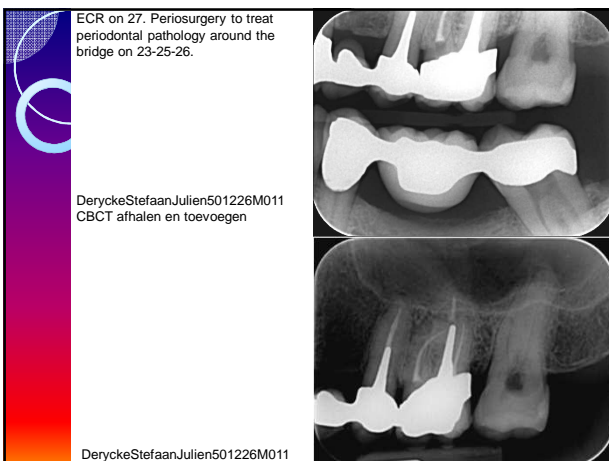


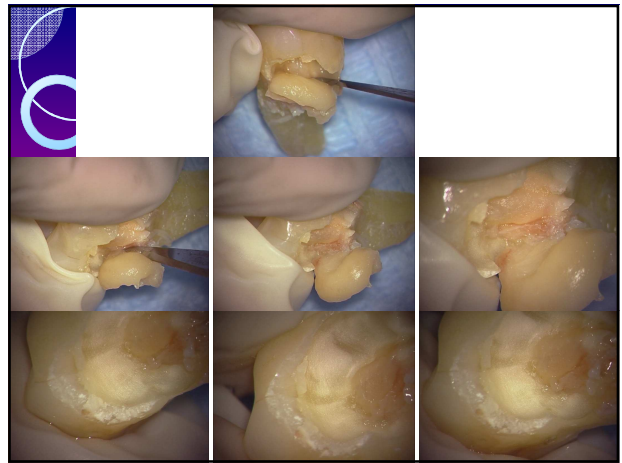
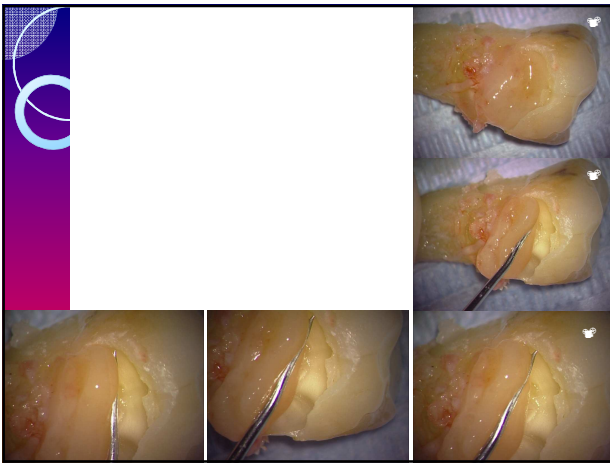
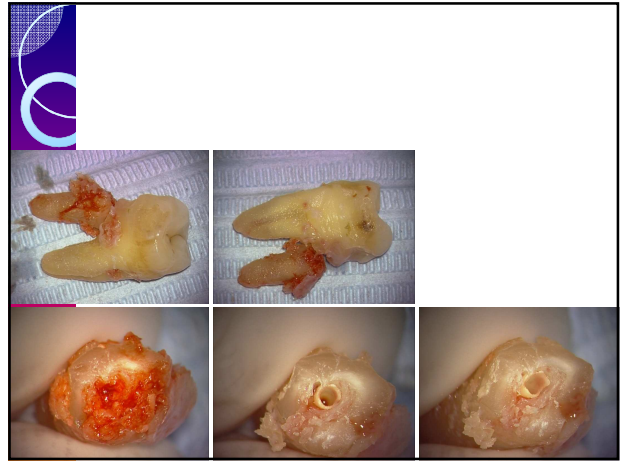
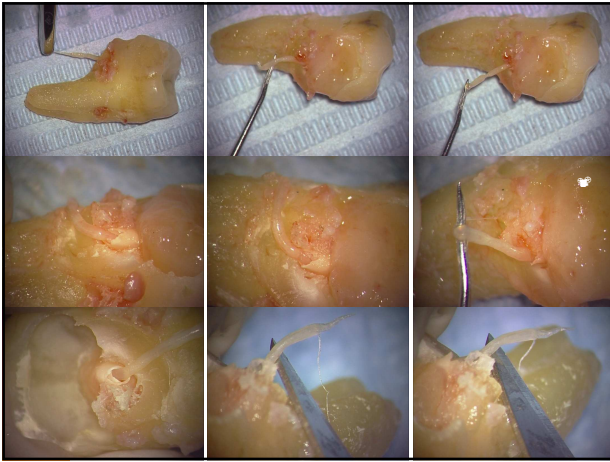
Different little entry cavities (due to orthodontics?)





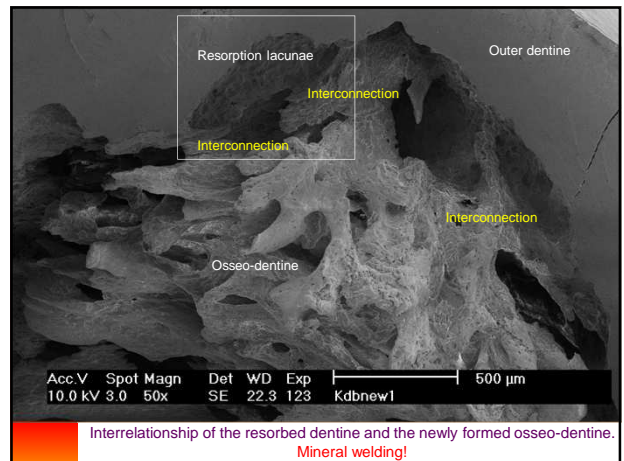
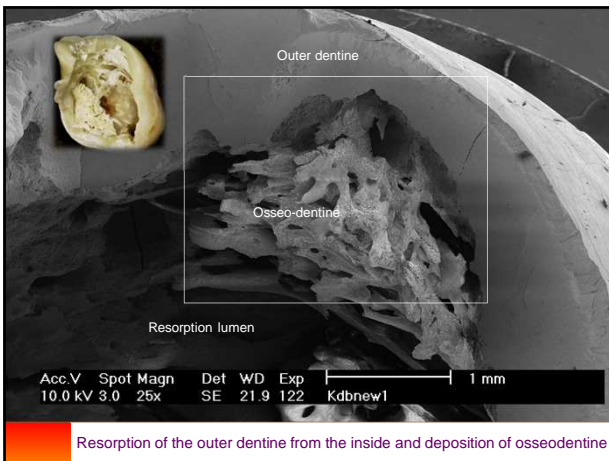
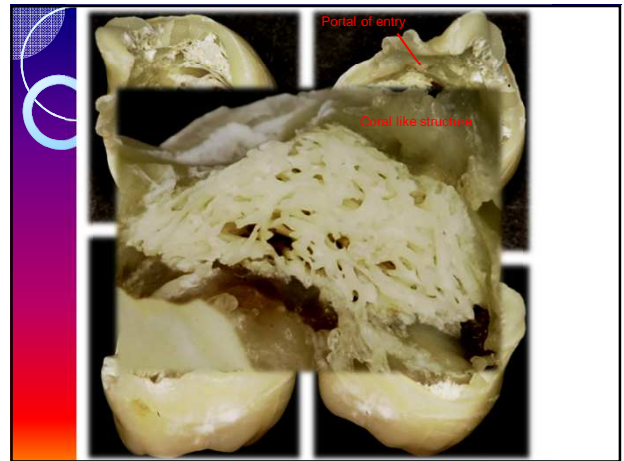
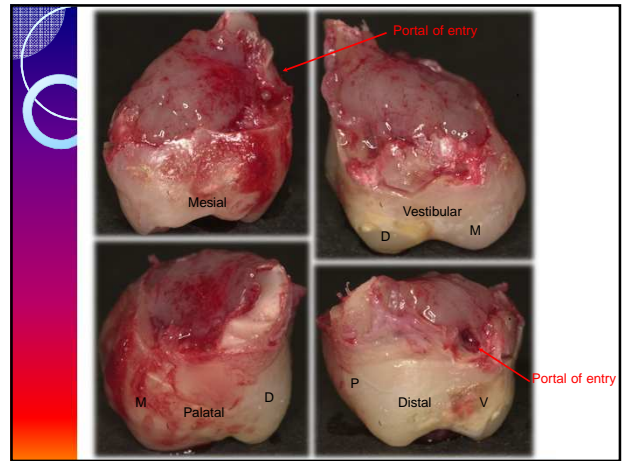
Molar Periosurgery Extraction

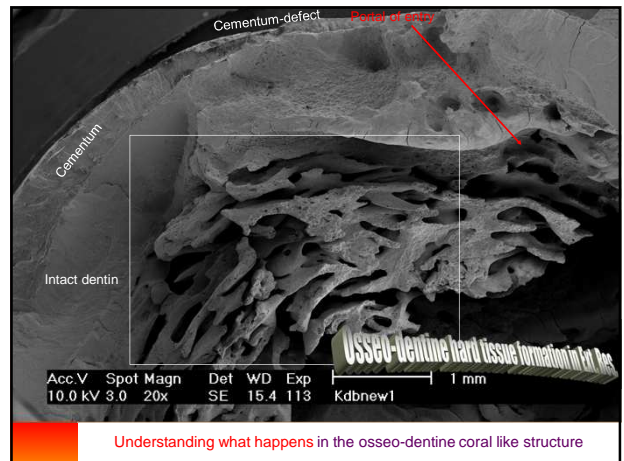
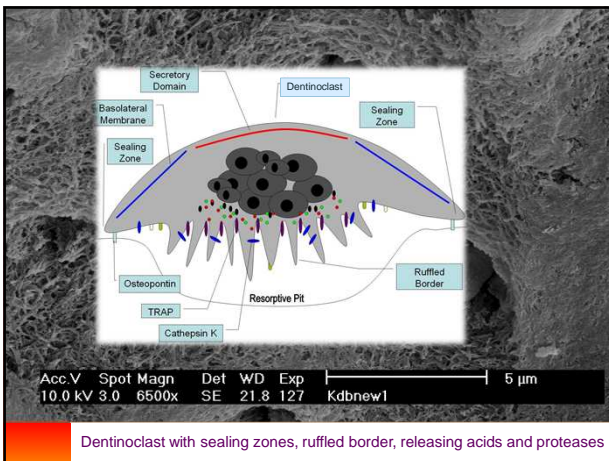
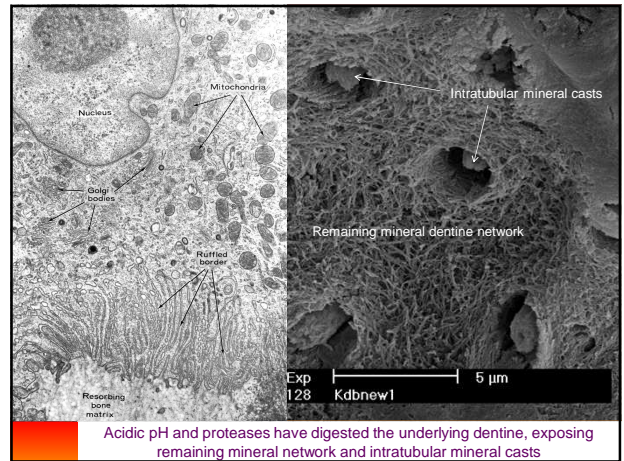
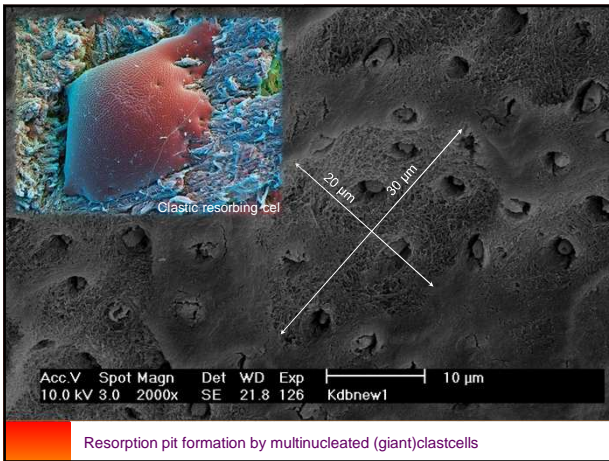
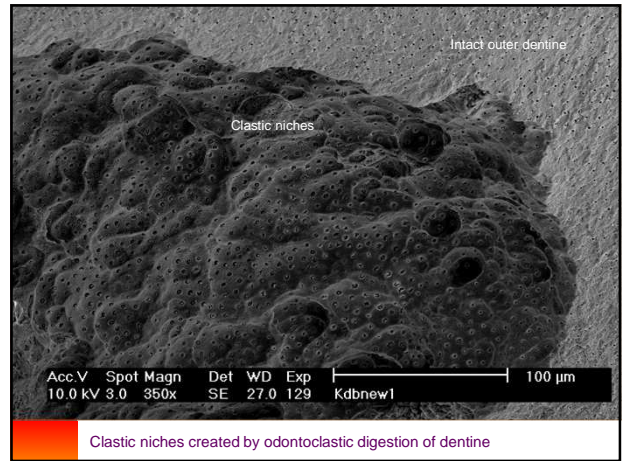
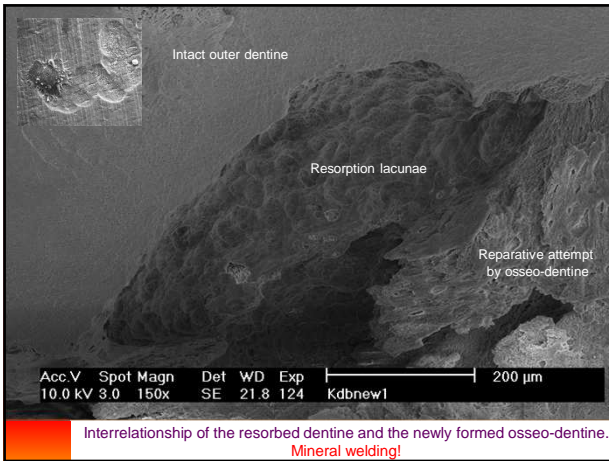


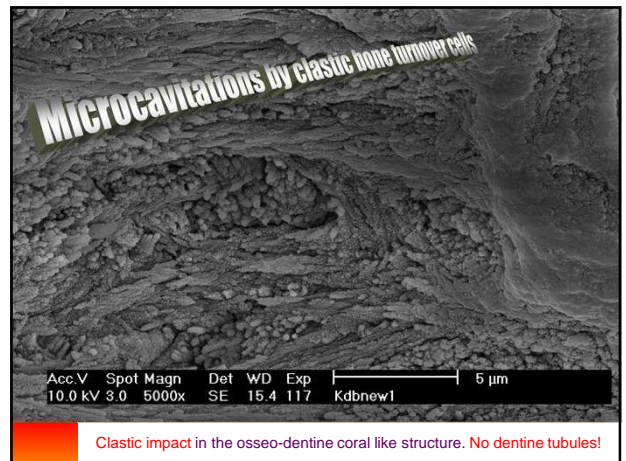
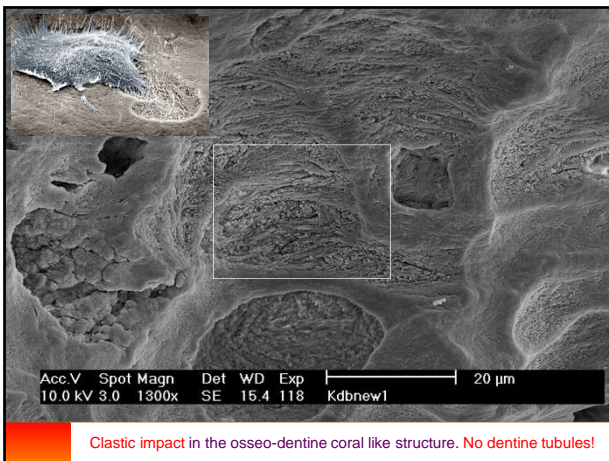
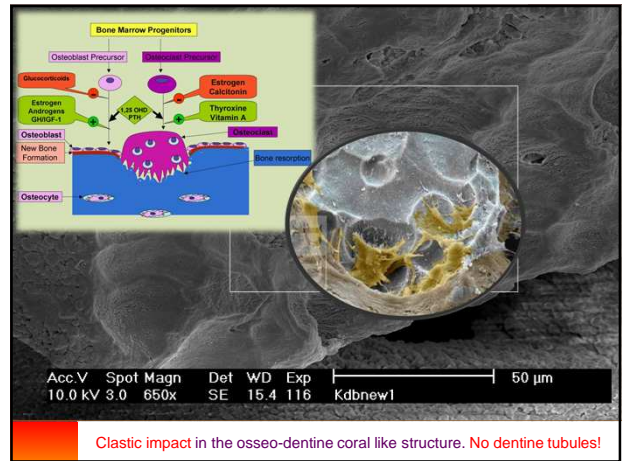
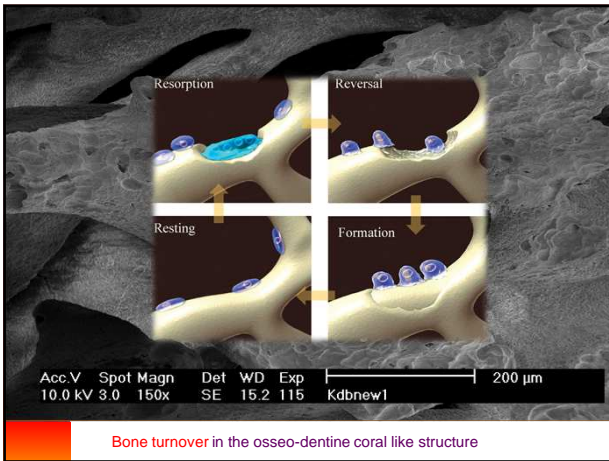
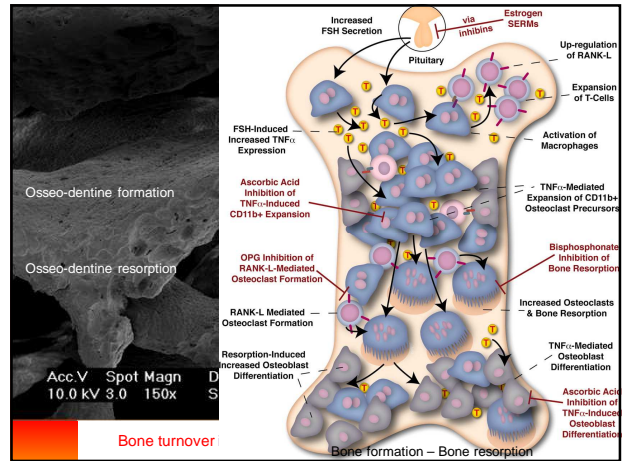
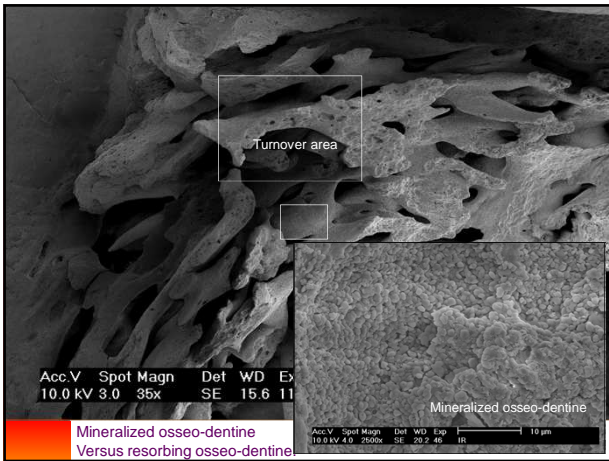


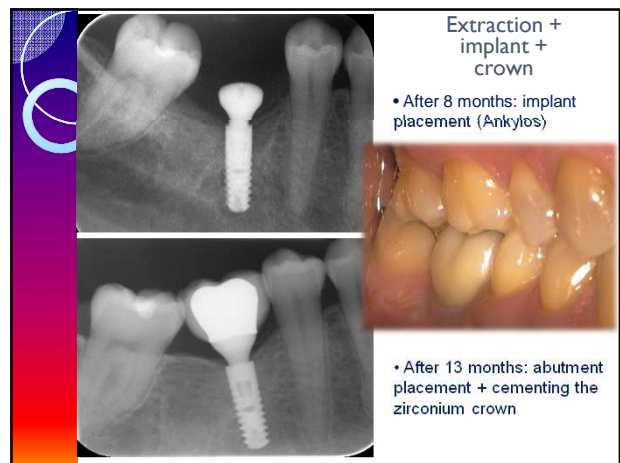
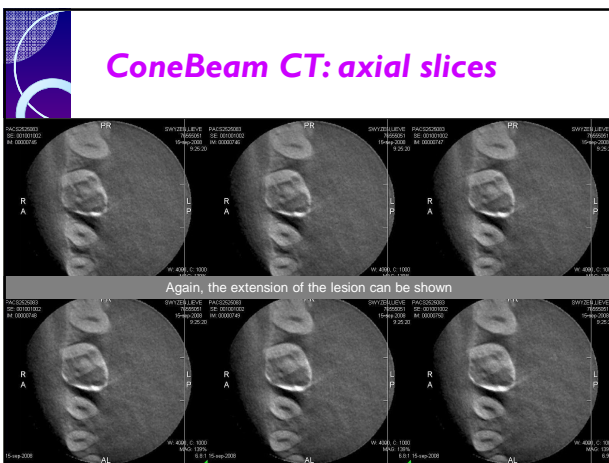
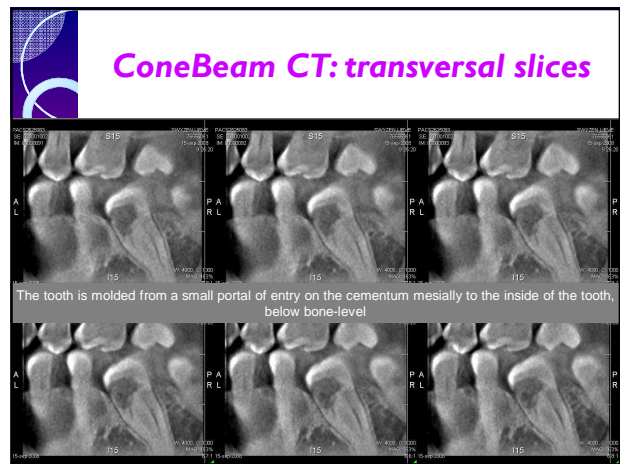
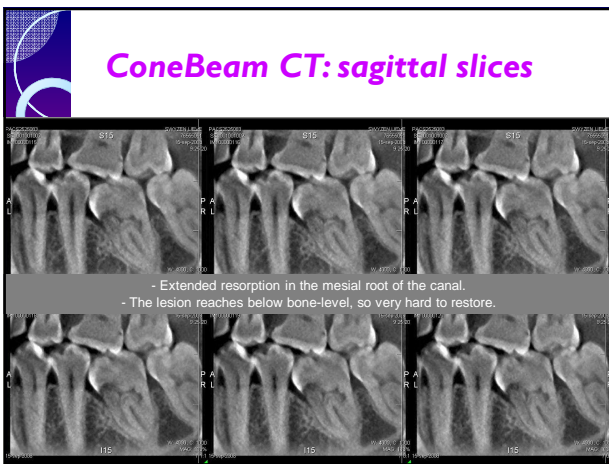
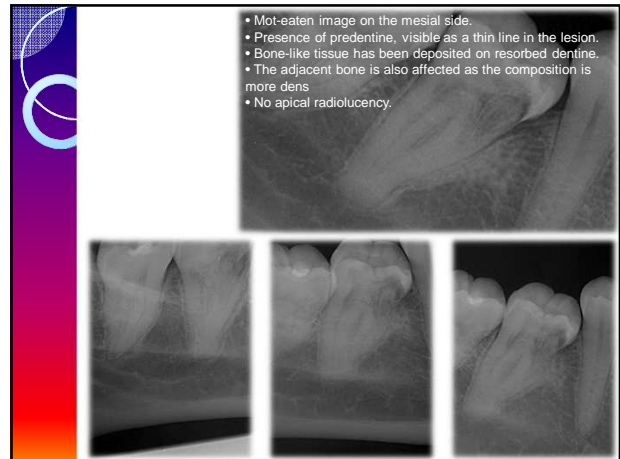
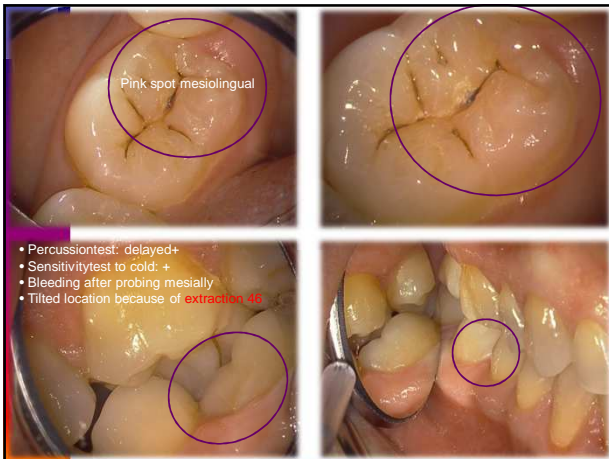
Molar. Osseodentine Extraction

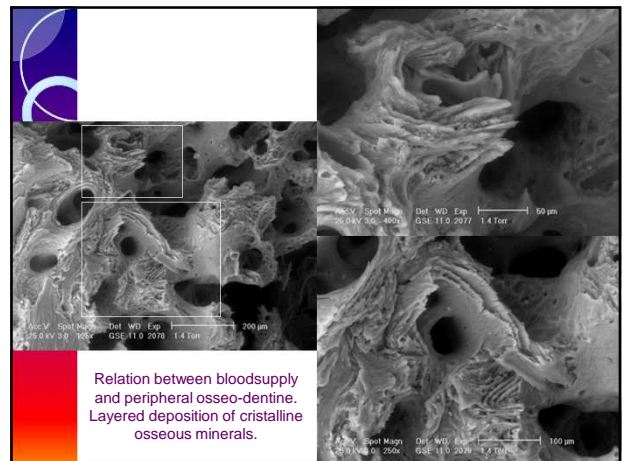
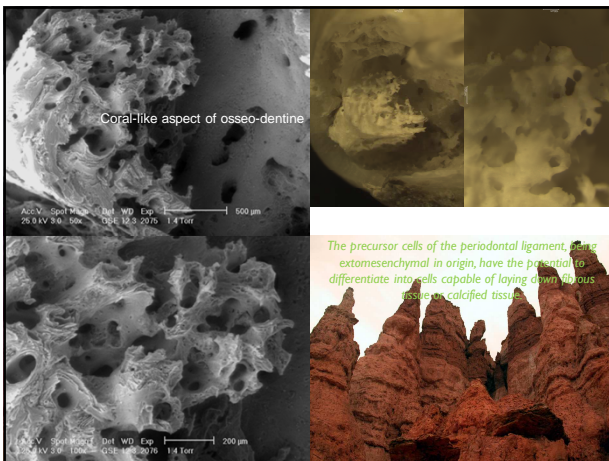
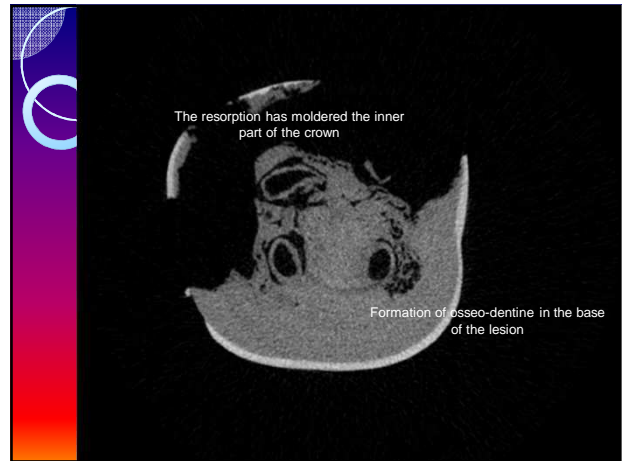
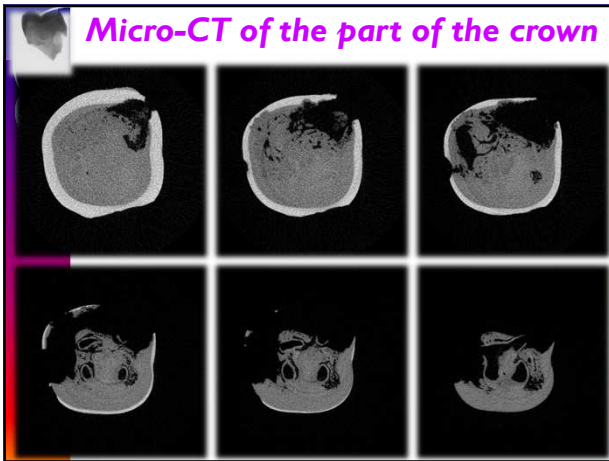
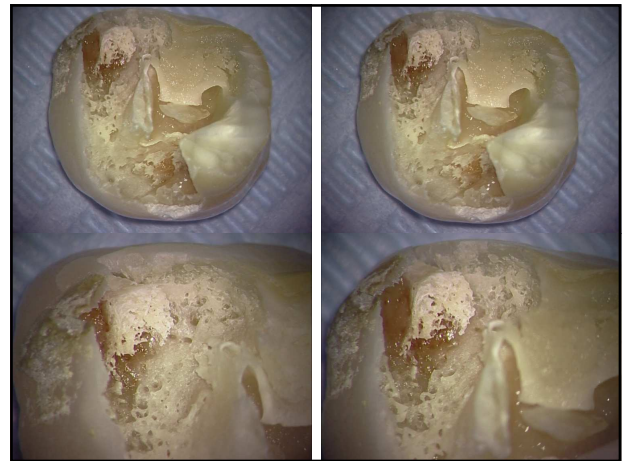
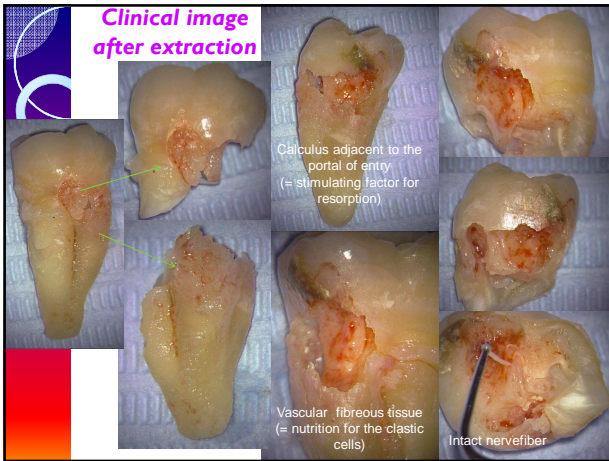


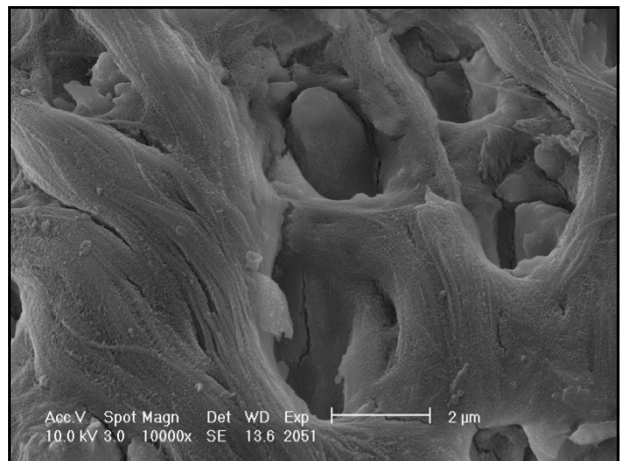
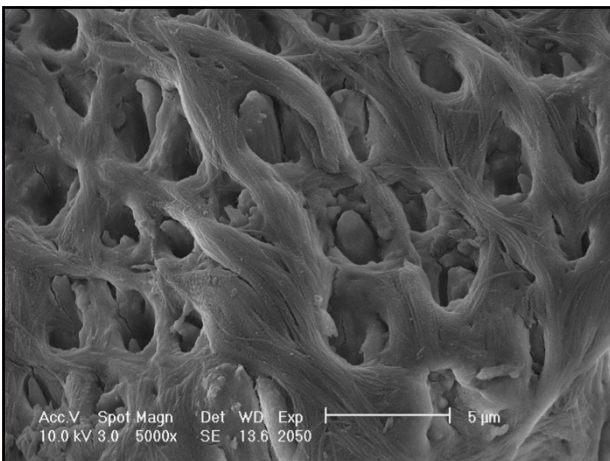
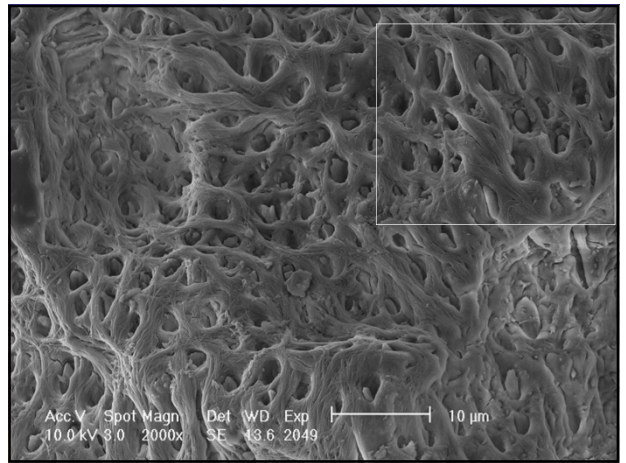
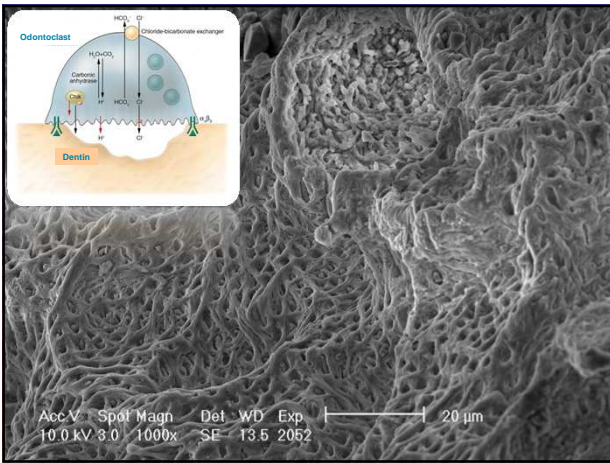
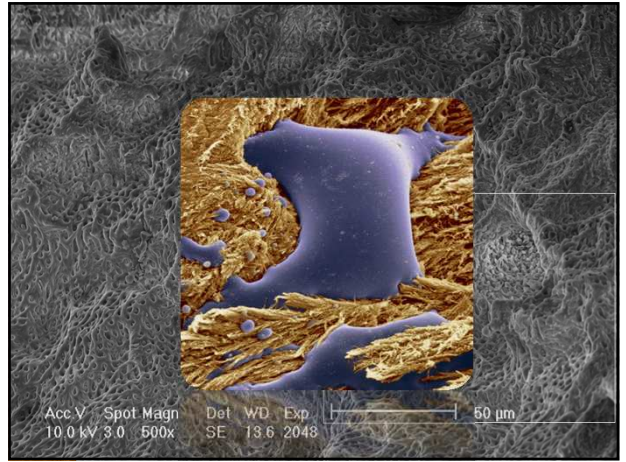
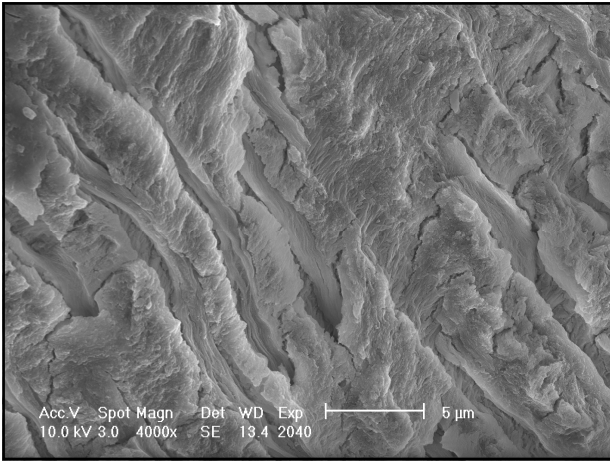


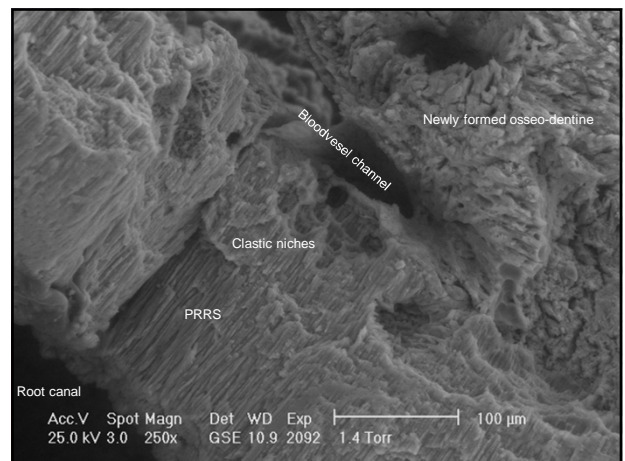
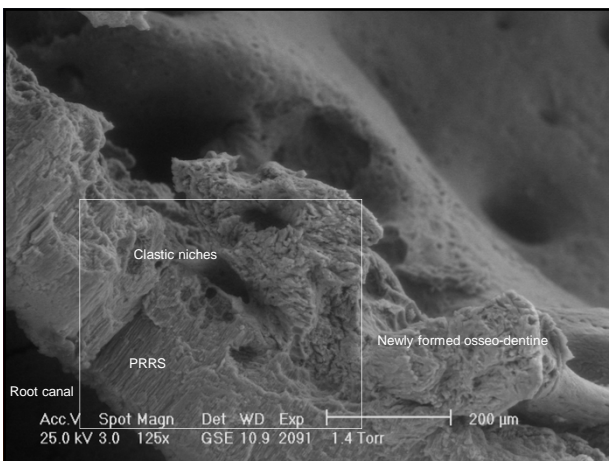
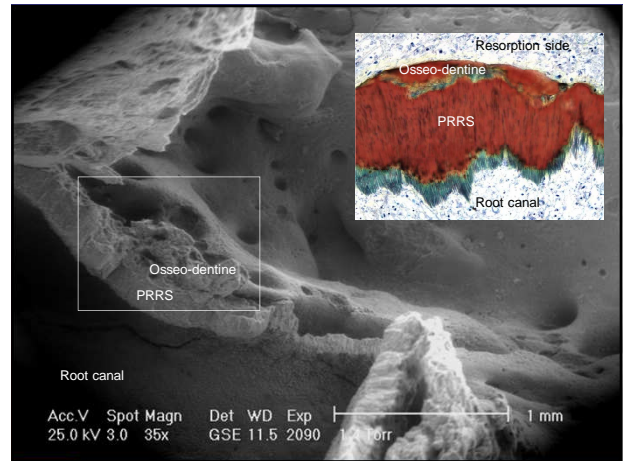
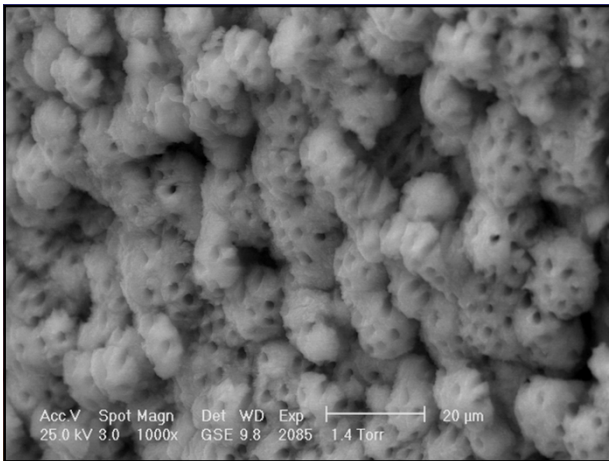
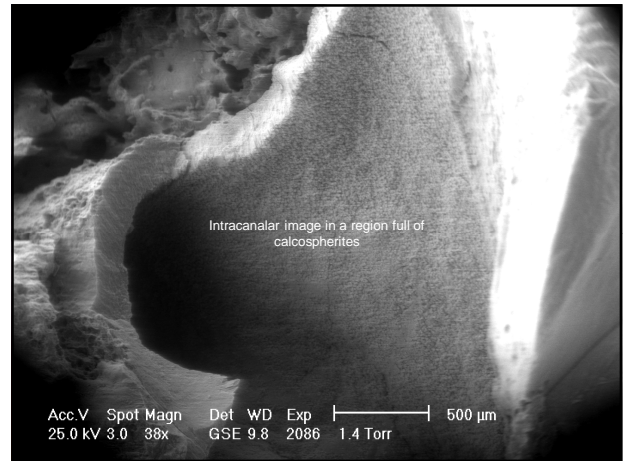
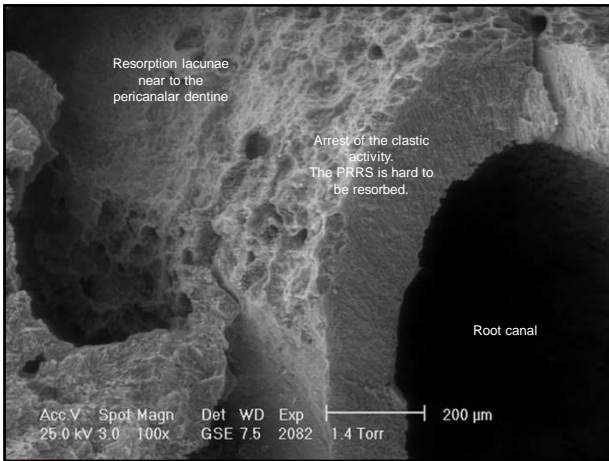


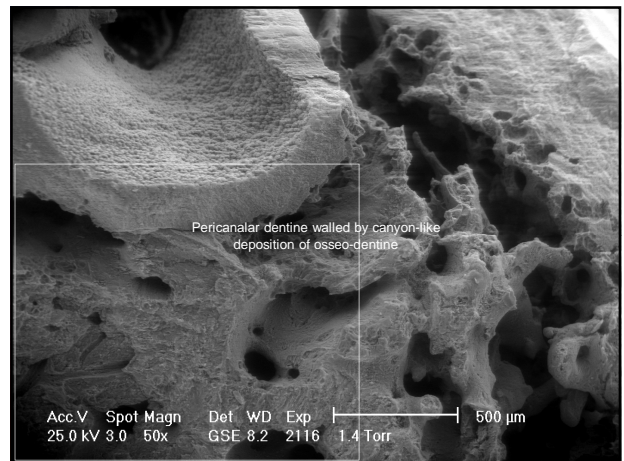
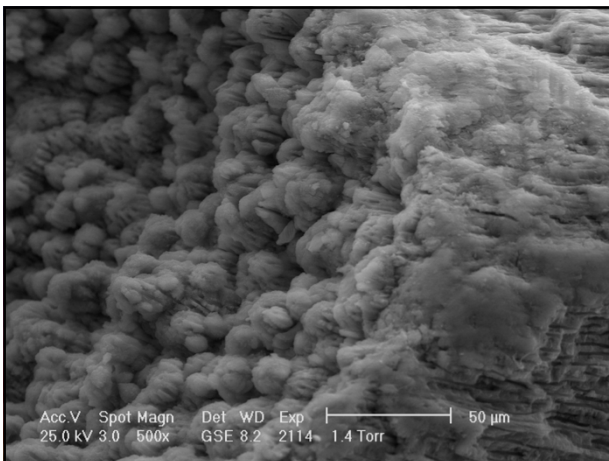
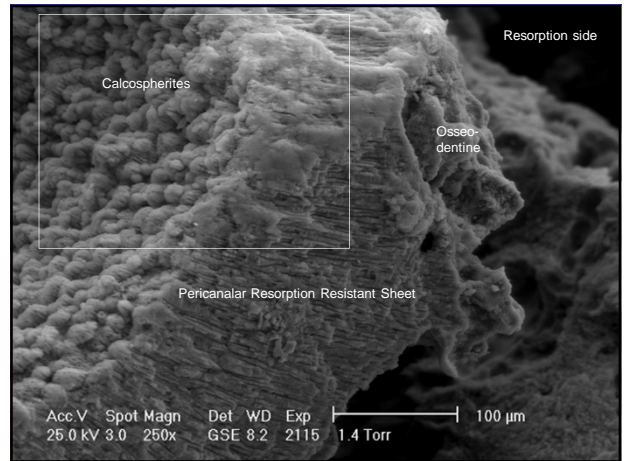
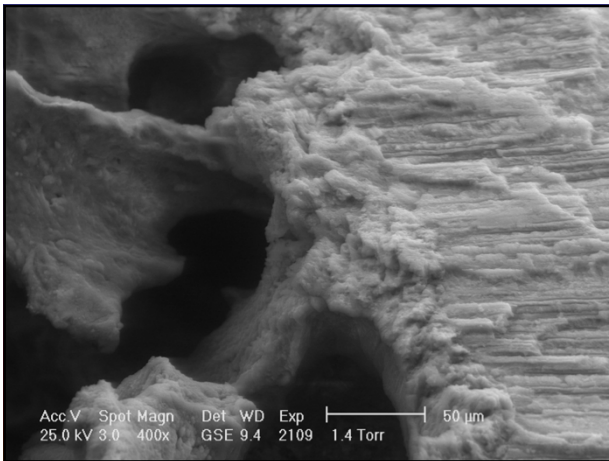
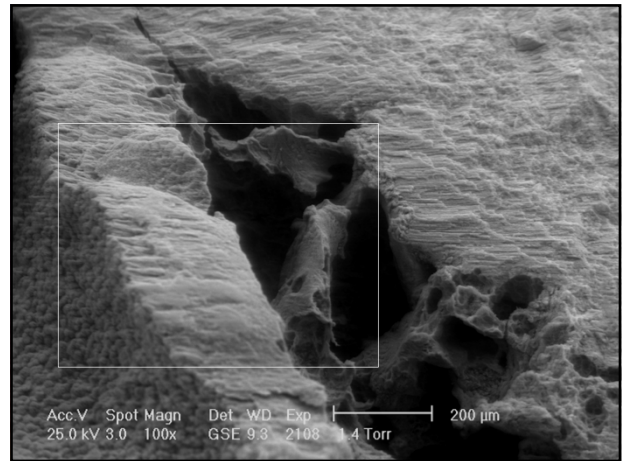
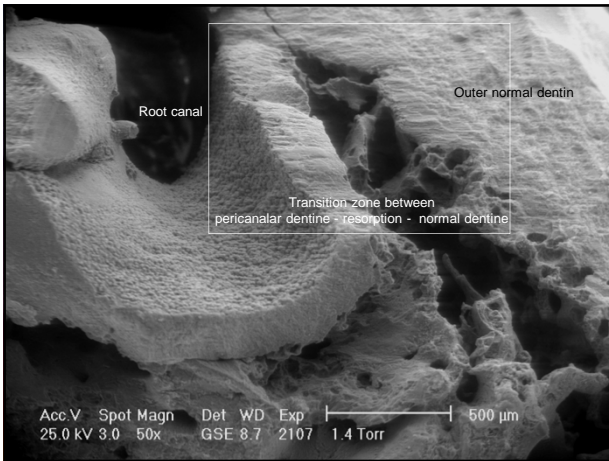


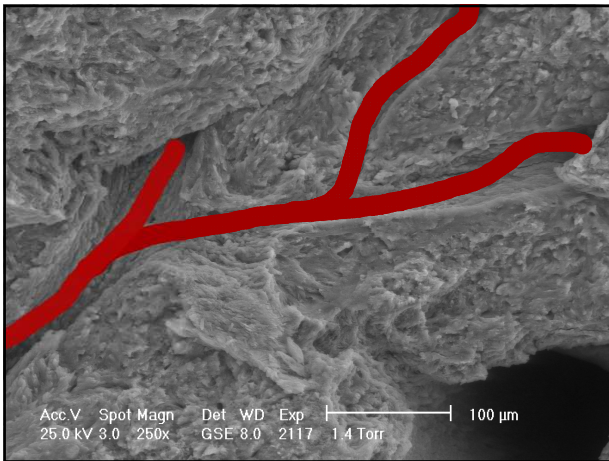
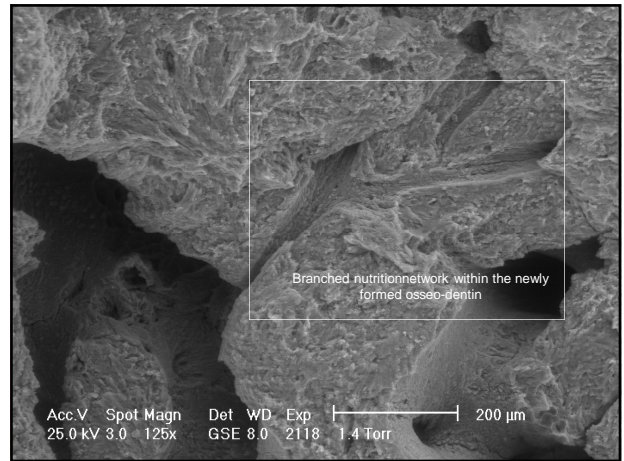
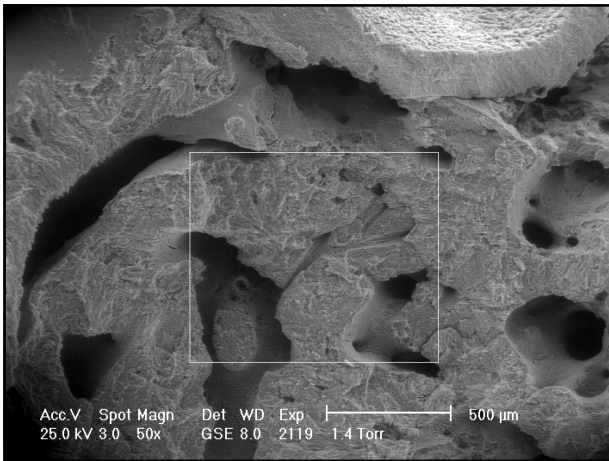












Molar. Extraction damage Tilting Periodontitis Hypoxia

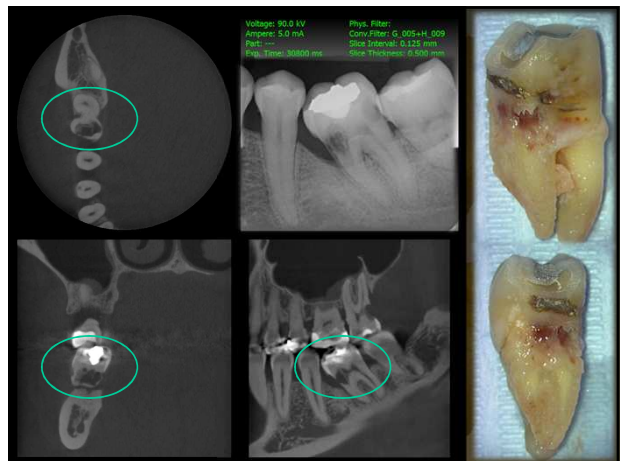
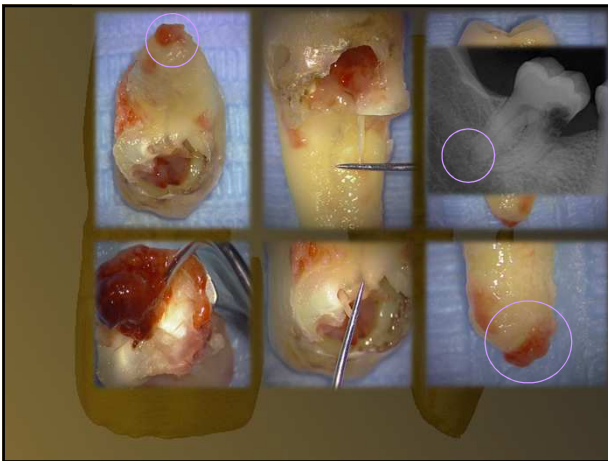
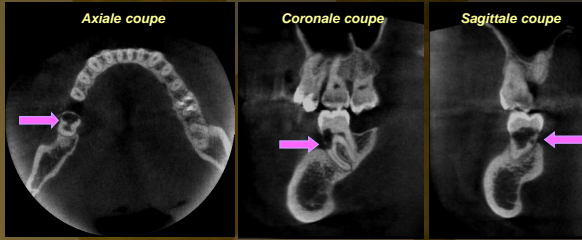


Patient Verslype Frank
Emdrn: 7011007m086

Intra-oral exam
Percussion: +
Sensitivity: +
Mesially 47:
Absence of attached gingiva
Alveolar mucosa in direct
contact with the
enamel/cementum junction
Pus and bleeding on probing

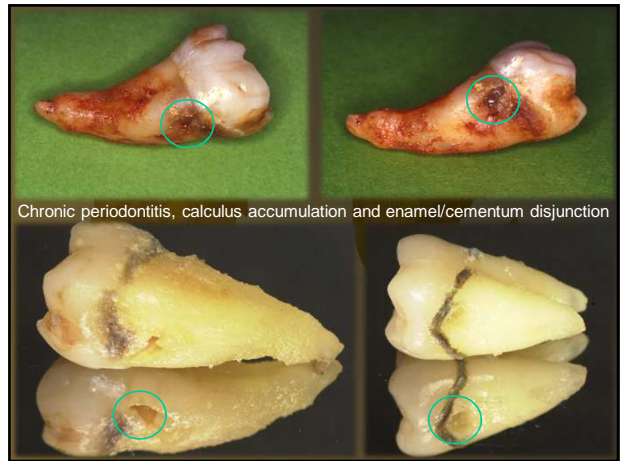
Specifiek probleem: 47

- Scanora CBCT beelden

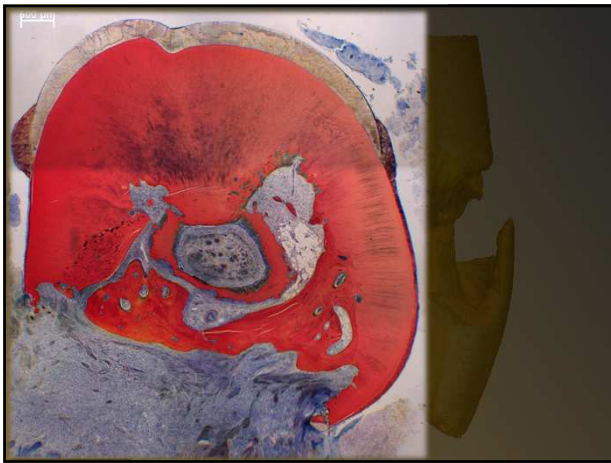




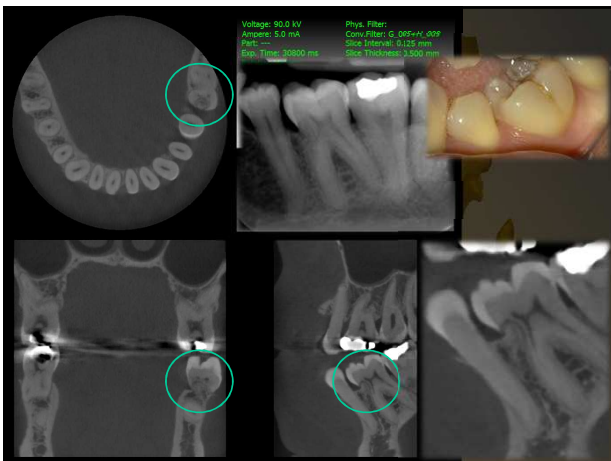
Martin Barco Rosario



Chronic periodontitis, calculus accumulation and enamel/cementum disjunction



2005 versus 2012, 7 years follow-up



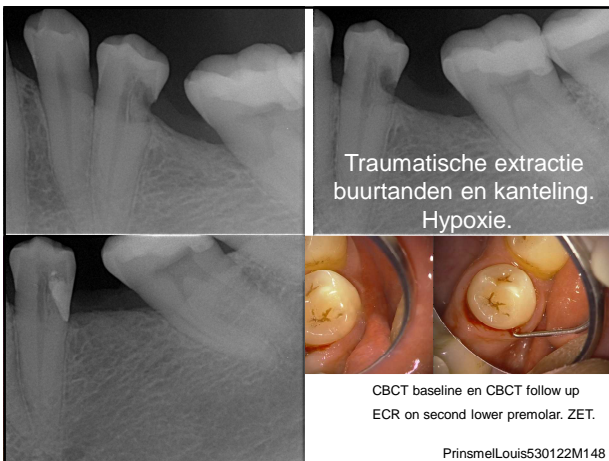
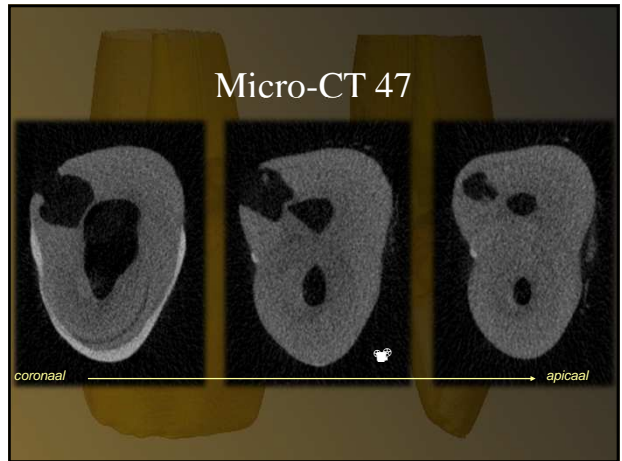
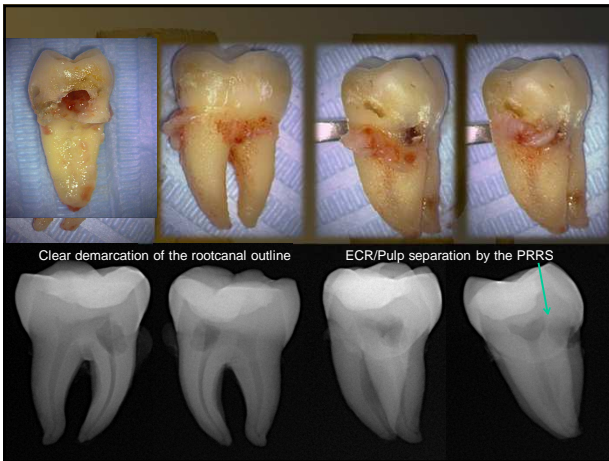
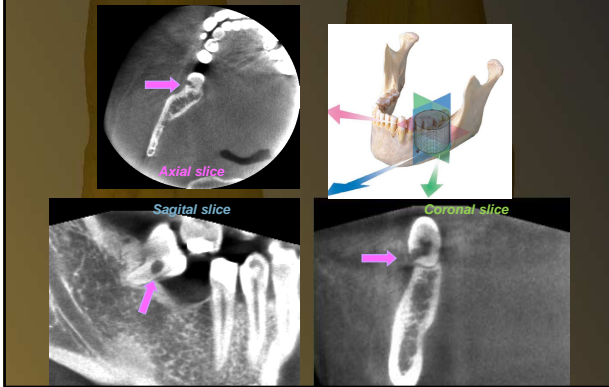
Voltage: 90.0 kV
 Amperage: 5.0 mA
 Pulse: ---
 Exp. Time: 90800 ms

Phys. Filter:
 Conv. Filter: G_045Fm_099
 Slice Interval: 0.125 mm
 Slice Thickness: 3.500 mm

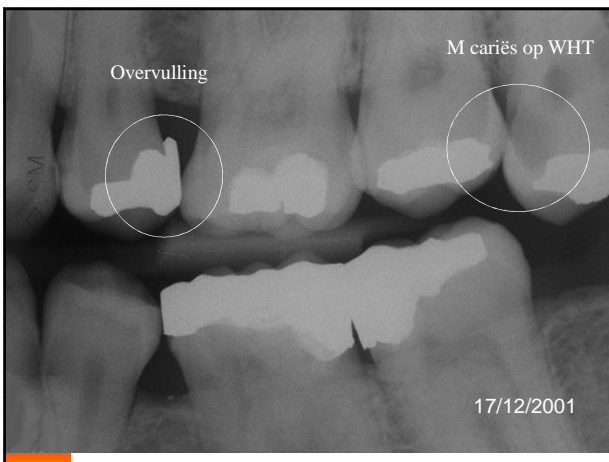
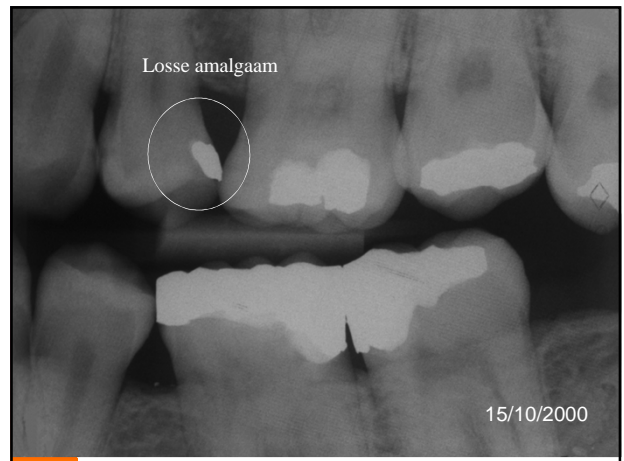
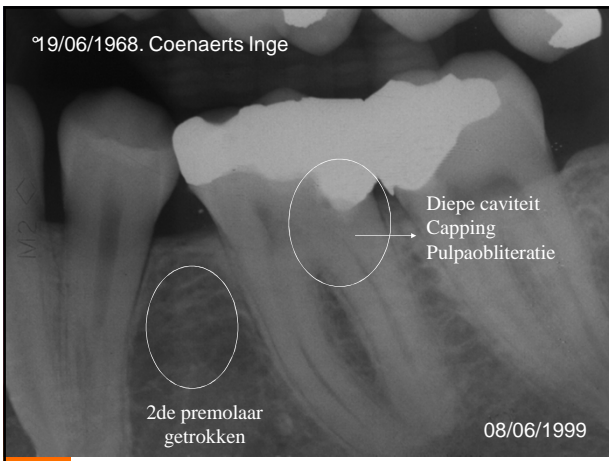


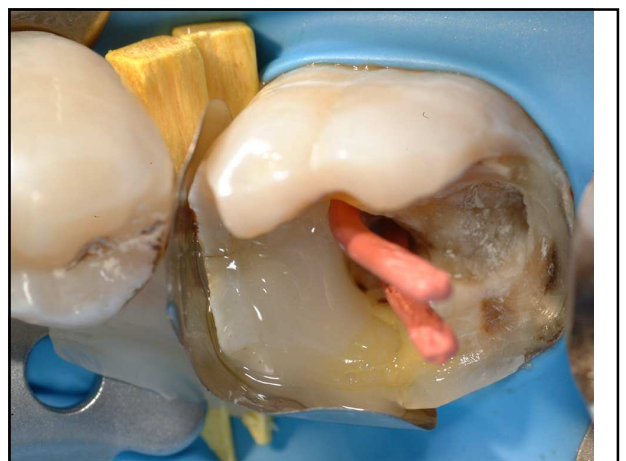
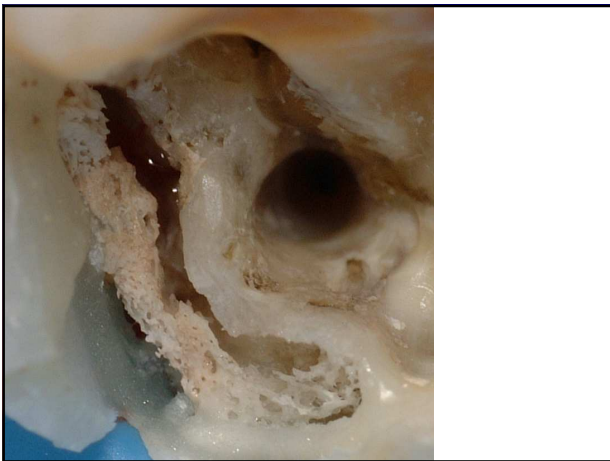
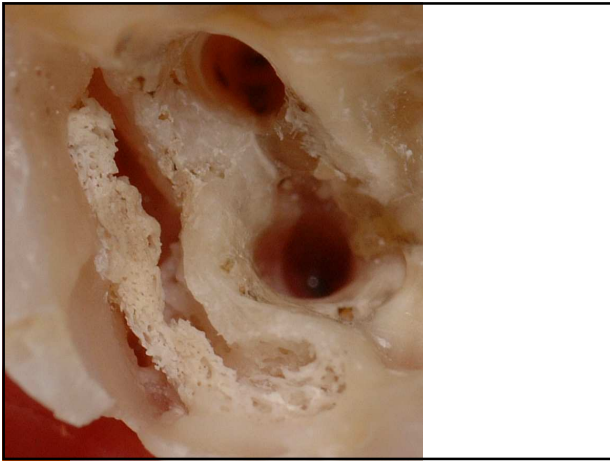
Clijsters Guido

Scanora CBCT-beelden van de 47



Molar.
Osseodentine
Infiltration therapy







Molar & premolar Cats

A decorative graphic on the left side of the slide consists of a vertical green bar and two overlapping white circles.



External cervical resorption

Damage to the cementum/periodontal ligament + (micro-organisms)

- Orthodontic displacement with cementum resorption (Pressure)
- Music instruments (Chronic repetitive pressure)
- Trauma with cementum damage (late complication)
- Internal bleaching with diffusion of the bleach and cascade-effect
- Periodontal root planing with cementum damage at and below the level of the periodontal ligament
- Periodontal surgery
- Chronic periodontitis and enamel/cementum disjunction
- Traumatic intraligamentary injection
- Uncontrolled placement of subgingival rubber dam clamps
- Crack until the level of the periodontal ligament
- Development groove
- Cementum damage of the neighbour tooth during elevator extraction
- Non vital bleaching
- Deep bite with abrasion effects in the cervical area
- Exfoliation and eruption disorders

Protective resorption resistant sheet

- It is known that osteoclasts will not adhere to non mineralized collagen matrices (Trope 1998). The activity of the classic cells is namely attributed to their binding to extracellular proteins containing the arginin-glycine-aspartic acid RGD sequence of amino acids. These RGD peptides are bound to calcium salt crystals on mineralized surfaces and serve as osteoclast binding sites. Importantly, the most external aspect of cementum is covered by a layer of cementoblasts over a zone of non mineralized cementoid, and therefore does not present a surface satisfactory for osteoclast binding. Internally the dentin is covered by a predentin matrix, a similarly organic surface. Thus, the lack of RGD proteins in both cementum and predentin reduces osteoclast binding and gives resistance to resorption (Blair 1998, Haapasalo 2006).
- Another hypothesis for the relative resistance of teeth to resorption maintains that intrinsic factors in predentin and cementum act as inhibitors of resorptive cells. This hypothesis is interpolated from knowledge about bone-homeostasis. It is known that certain factors inhibit the resorptive process in bone. One such factor is osteoprotegerin (OPG), a novel member of the tumor necrosis factor (TNF) superfamily that has the ability to inhibit osteoclast-mediated bone loss. OPG acts as a decoy receptor by binding to the receptor activator of NF- κ B ligand ranks, which reduces its concentration and thereby inhibits the ability of RANKL to stimulate osteoclast production (osteoclastogenesis). It is known that human gingival fibroblasts, human periodontal ligament cells and human pulp cells possess the ability to produce OPG (Patel 2010, Trope 1998, Von Arx et al. 2009).
- Wedenberg & Yumita (1990) are talking about the presence of an extractable inhibitor of osteoclastic attachment in cementum and predentin, which explains the natural resistance of these non collagenous, organic component within dentin.
- It has also been demonstrated that the circum-pulpal dentin in close proximity to the predentin is spared from root resorption, even though most of the peripheral dentin may have been resorbed. A hypothesis is that this could be due to specific dentinogenic events, such as tertiary dentinogenesis. When odontoblasts are destroyed, as in rapidly progressive caries lesions, a cascade of inflammatory and healing events results in proliferation and migration of fibroblast-like cells toward the exposed circum-pulpal dentin forming fibrodentin. This fibrodentin might be seen as a defensive matrix. Ultrastructurally, this matrix exhibits numerous foci of highly mineralized ground substances with strong glycosaminoglycan reactions and dispersed collagen fibrils (Tziatas 2010). Can it be that there are too much osteoclast binding sites on this highly mineralized matrix, that resorption is retarded? It has previously shown through in vitro studies and analysis of mineralization that there is a relationship between the rate of resorption and the mineral concentration; less mineralized tissues are resorbed more rapidly (Reid 1986).