

Nascholingsavond  
Praktijk voor Parodontologie  
Nijmegen  
12 oktober 2011

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

Prof. Paul Lambrechts and Prof. Lars Bertramans  
&  
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Richard Hakse, Stefanie Mullaert, Inne Vingerhouts, Mieke Deketelaere, Geertje  
Van Gorp, Koen Lissens, Leen Theys, Aline Neves  
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

**Cementum is a dentine protective factor**

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

Types of hard 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

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)

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

Orthodontic treatment

Cementum is a dentine protective factor

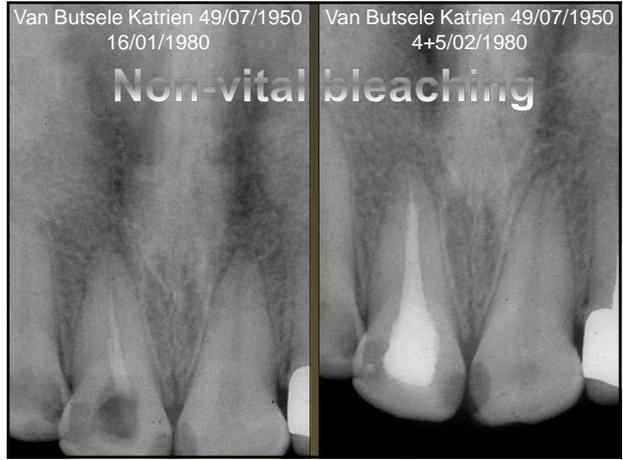
The PRRS (pericanalar resorption resistant sheet) including predentine is a pulp canal protective layer

Osseo-dentine can partially replace the resorption defects

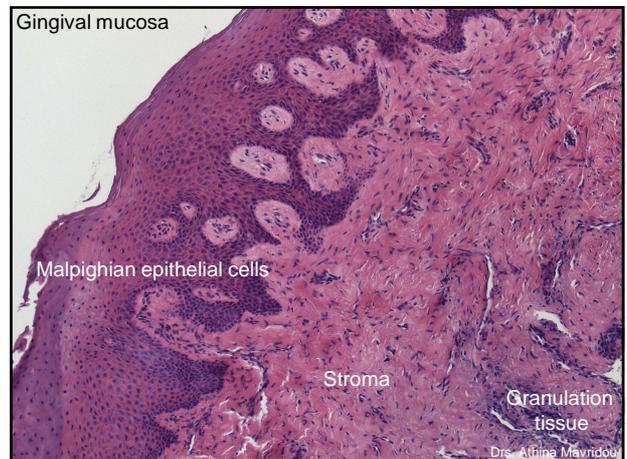
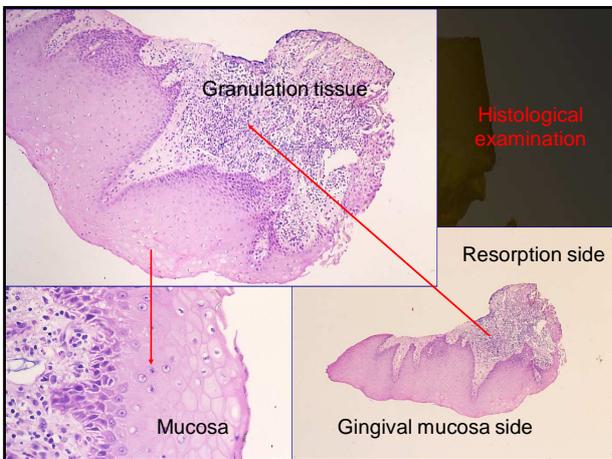
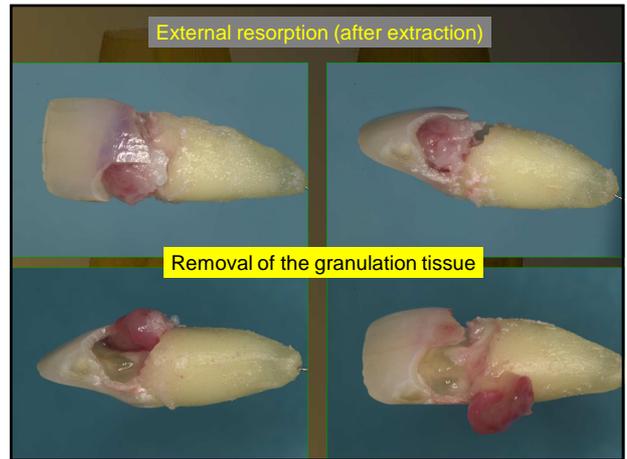
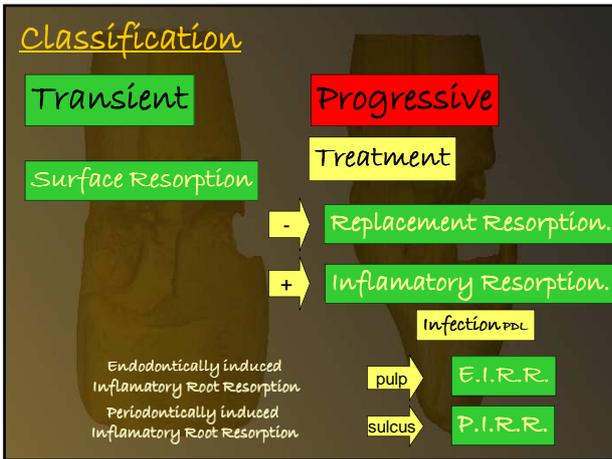
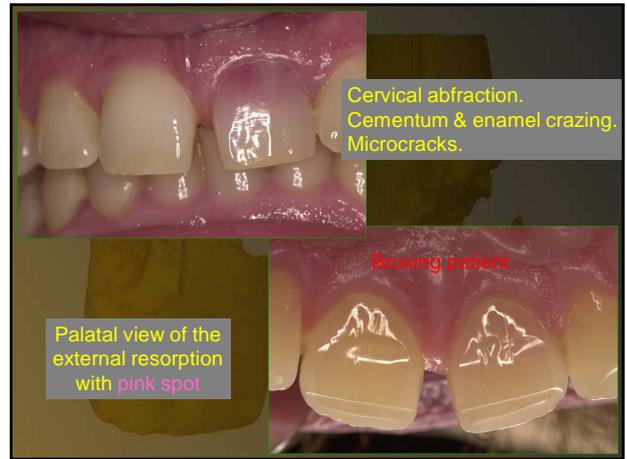
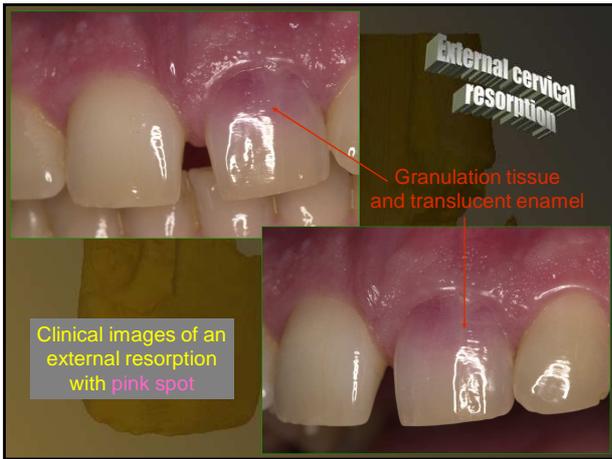
Osseo-dentine

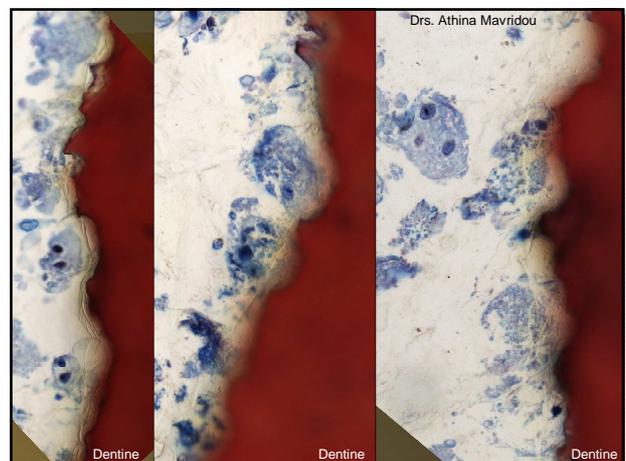
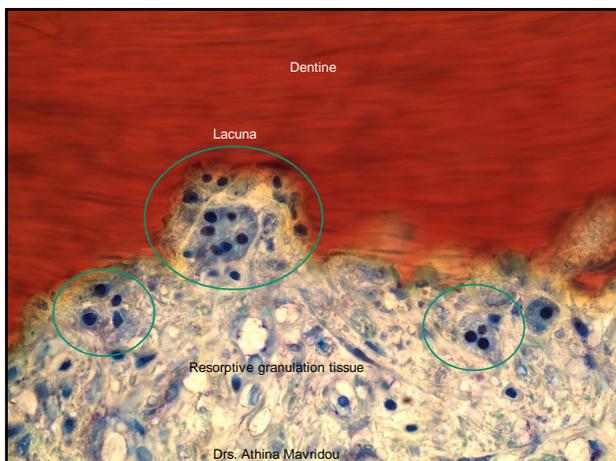
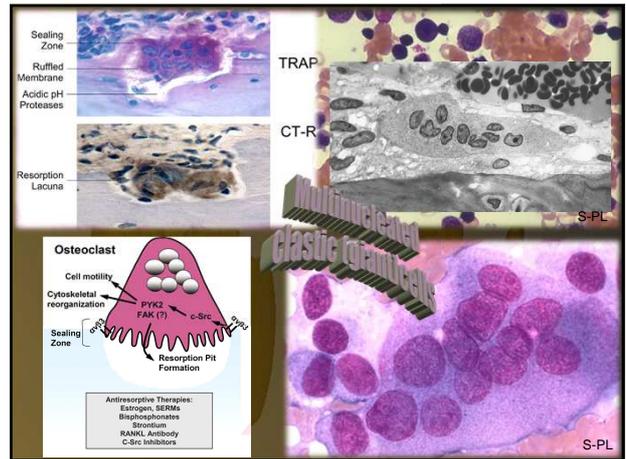
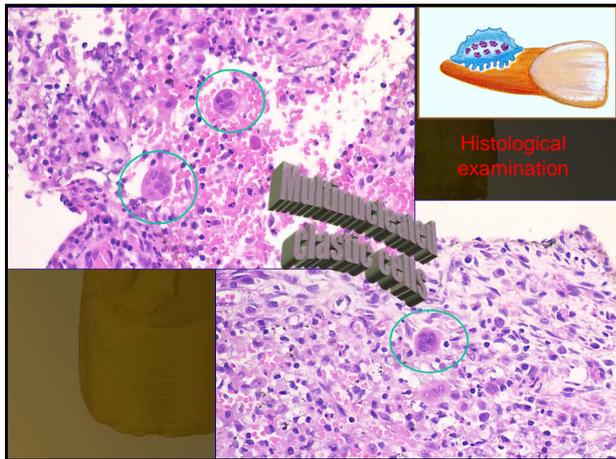
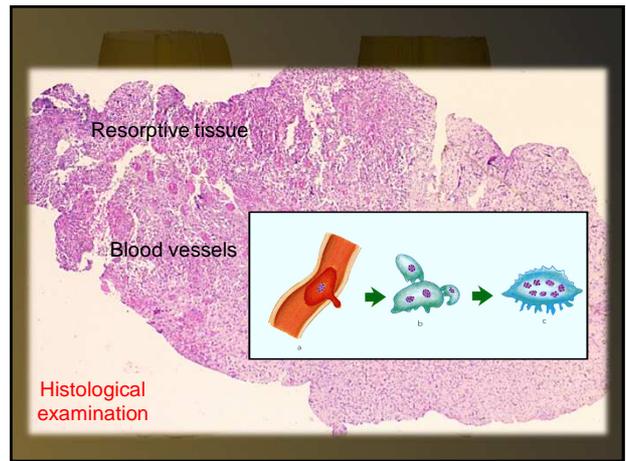
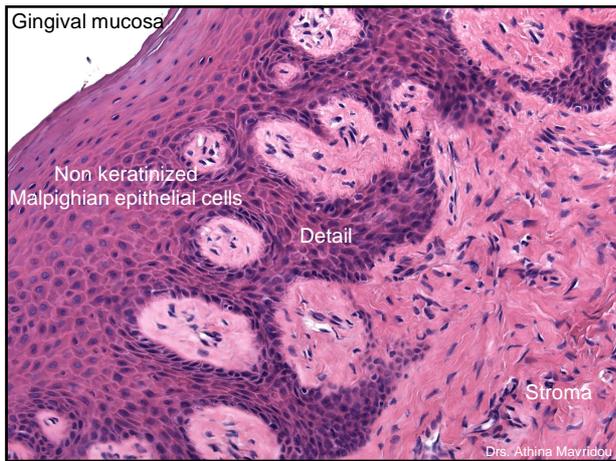
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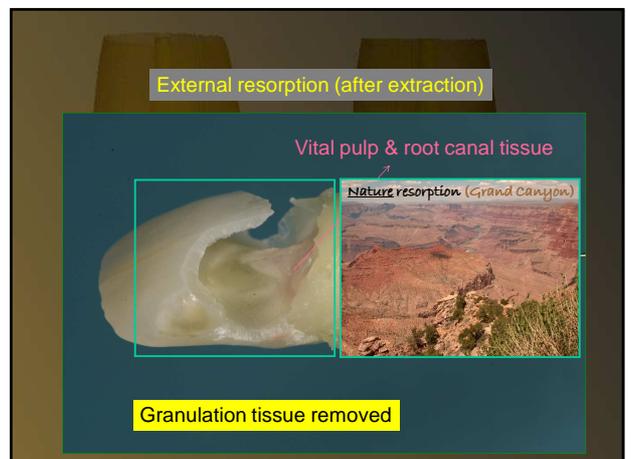
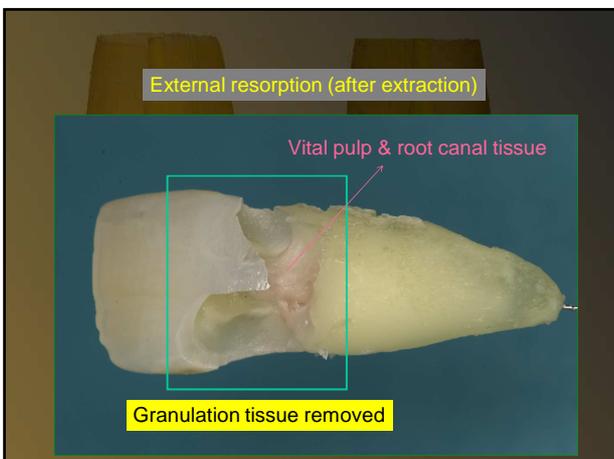
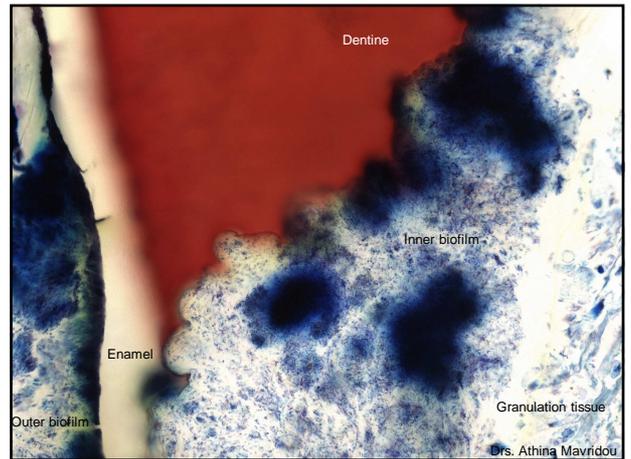
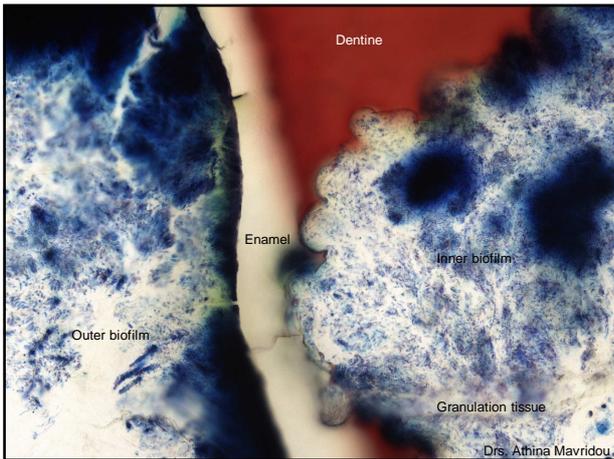
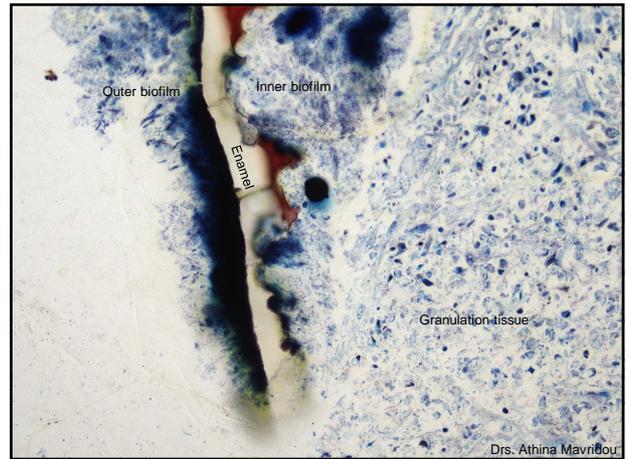
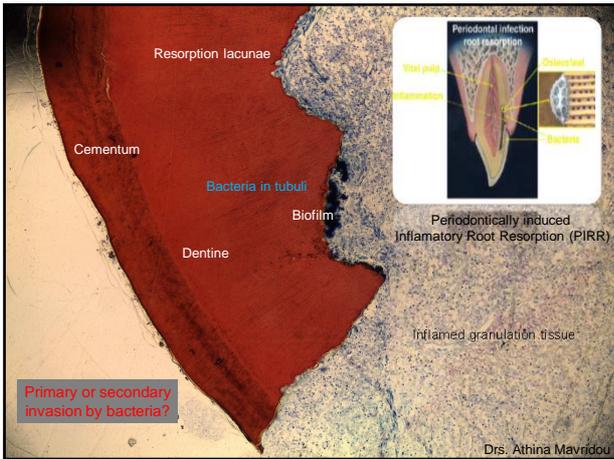
Fronttooth.  
Bleaching

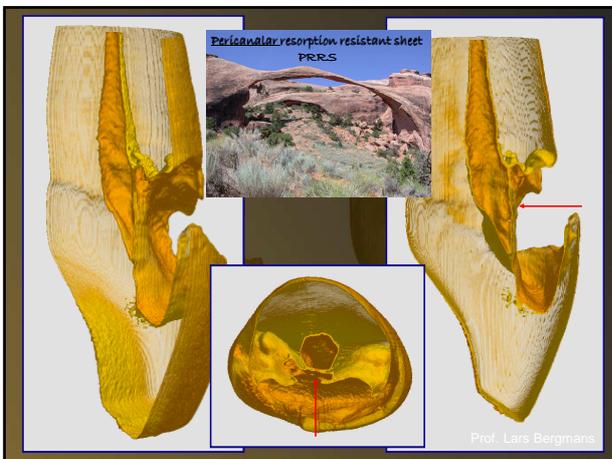
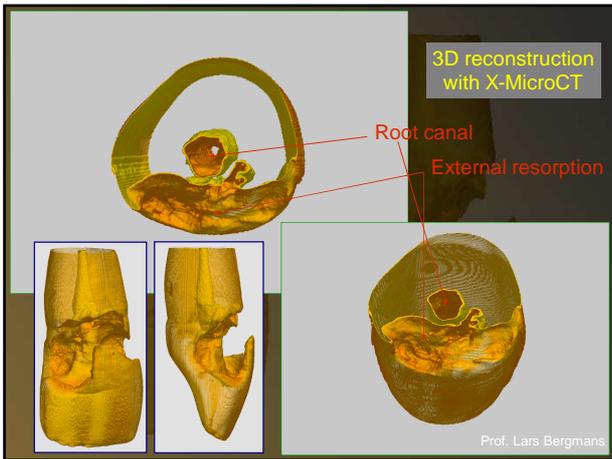
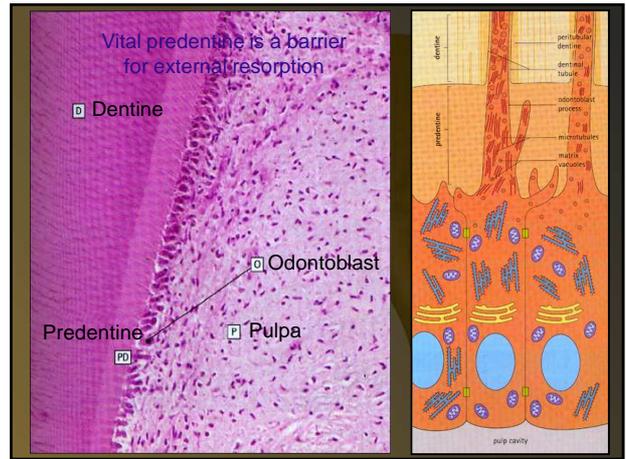
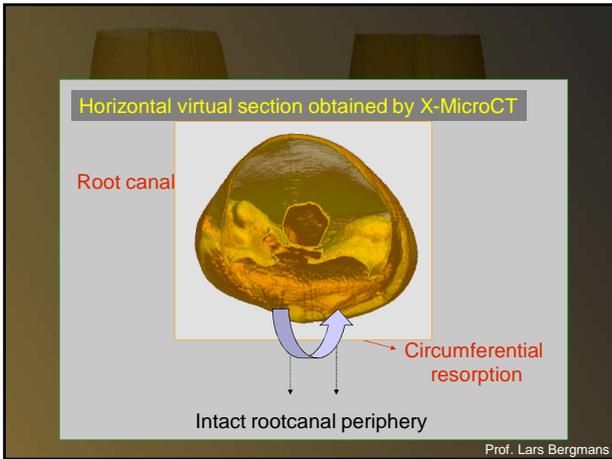


Fronttooth.  
Bruxism  
Extraction  
X-MicroCT

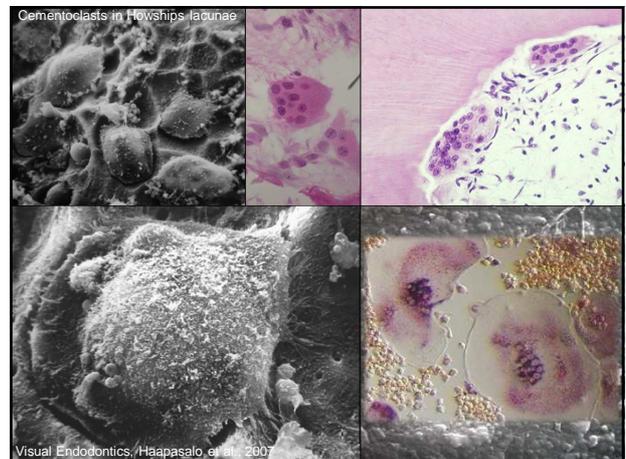
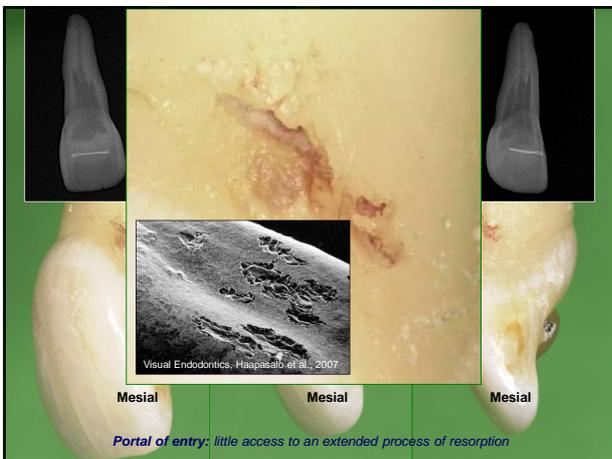
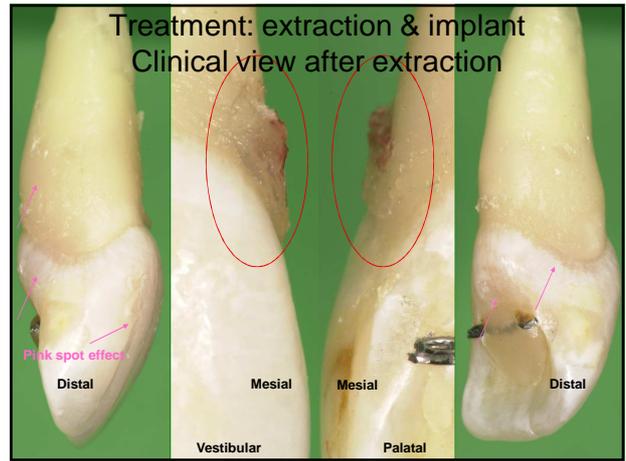
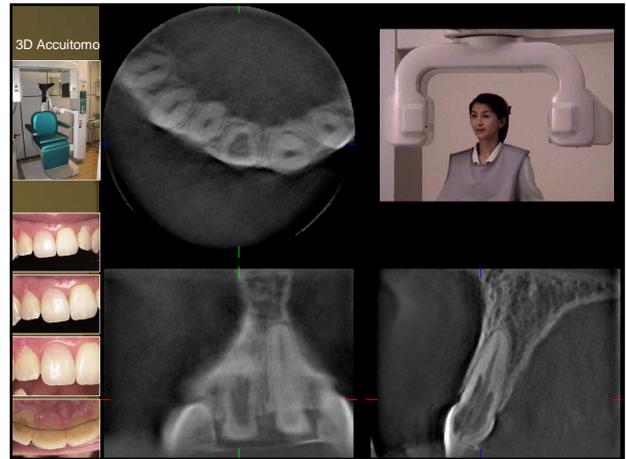


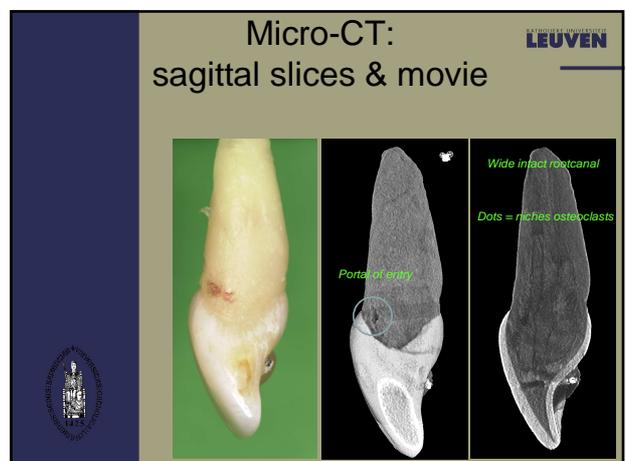
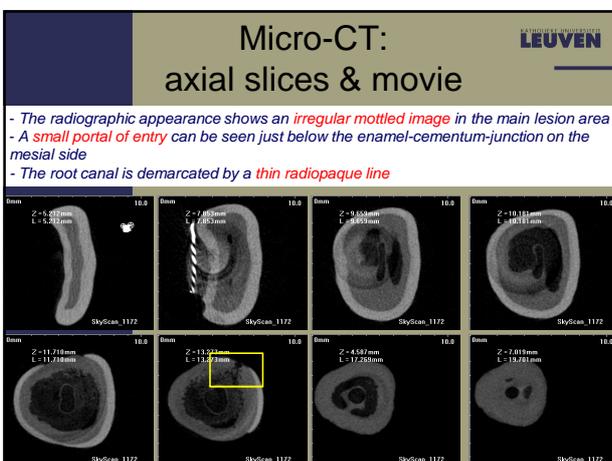
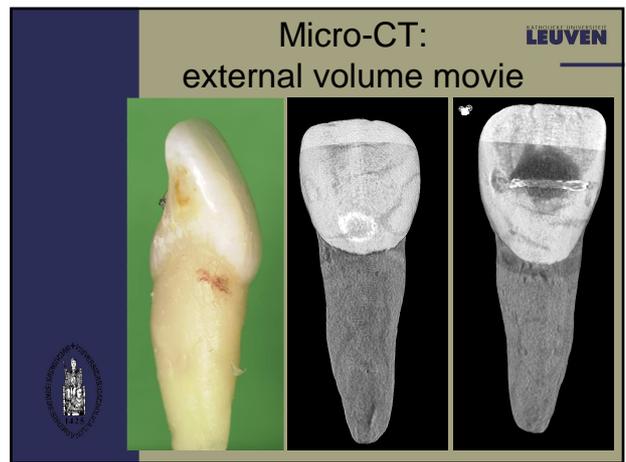
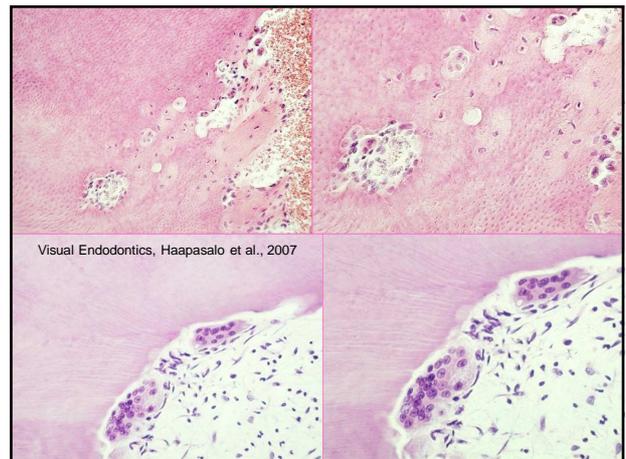
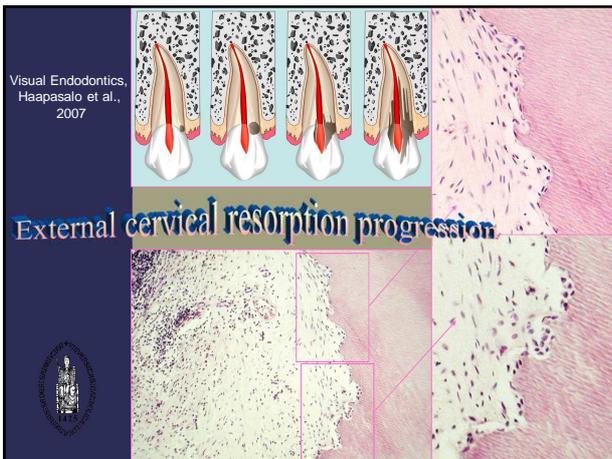






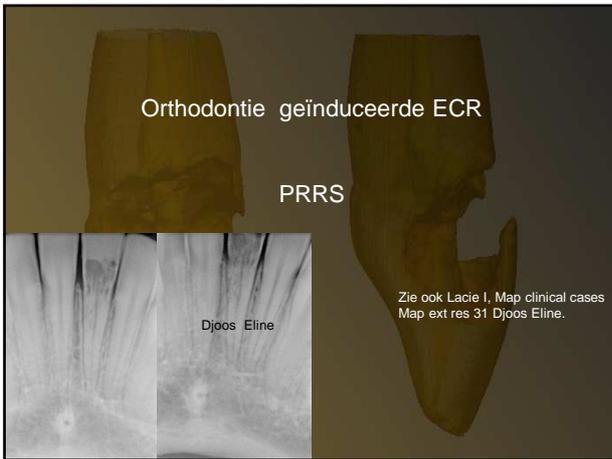
Fronttooth.  
Orthodontie  
Extractie  
X-MicroCT



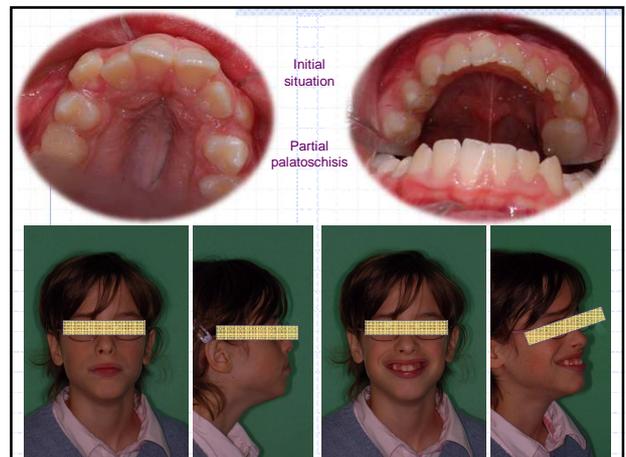


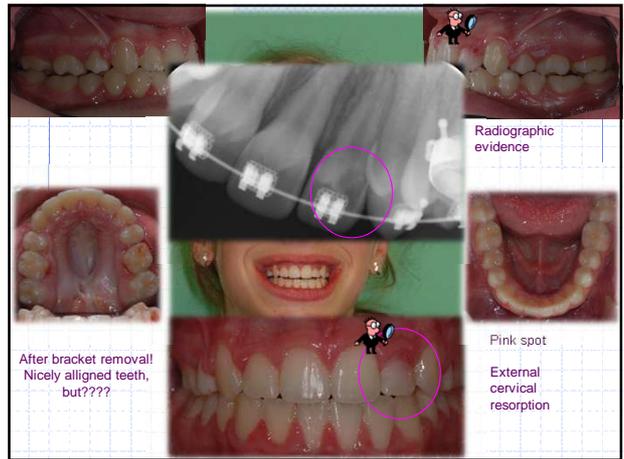
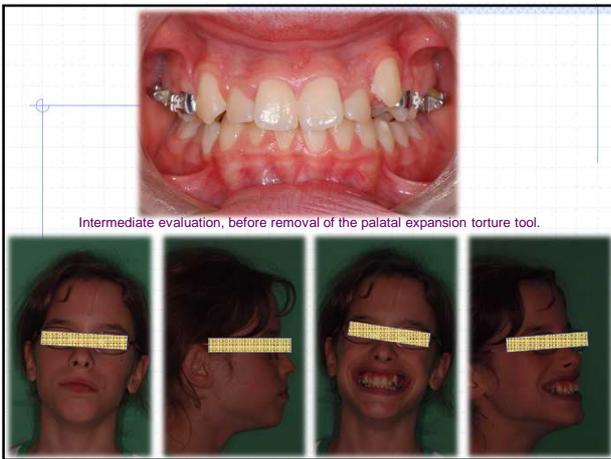
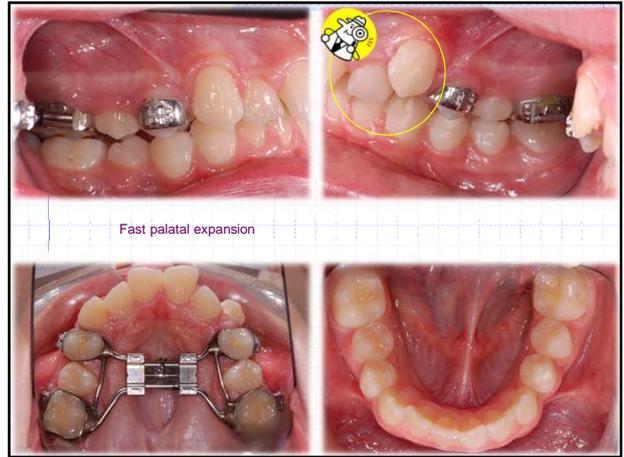


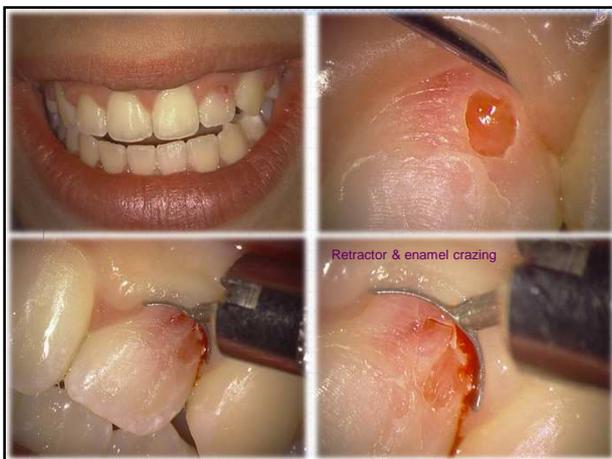
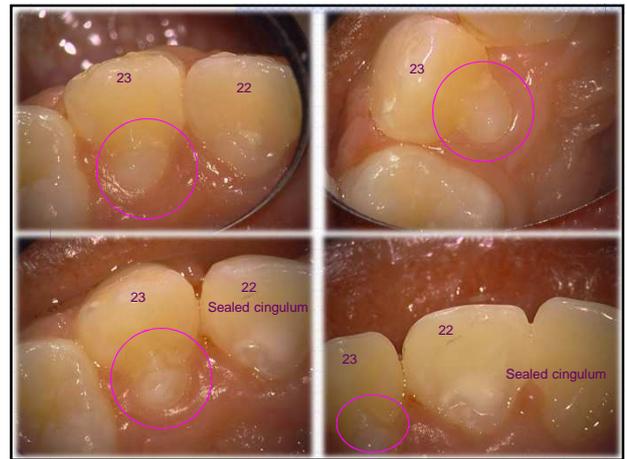
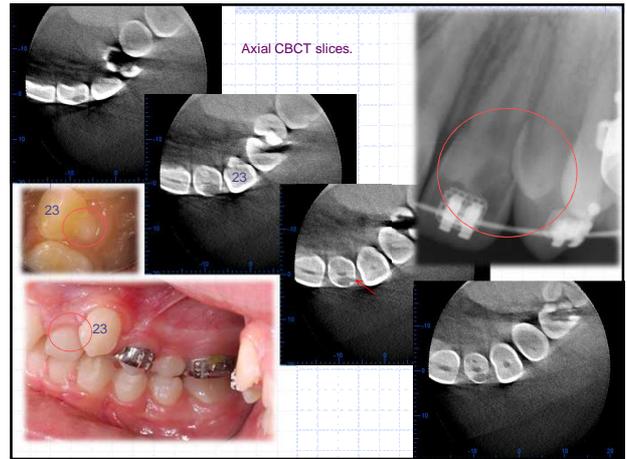
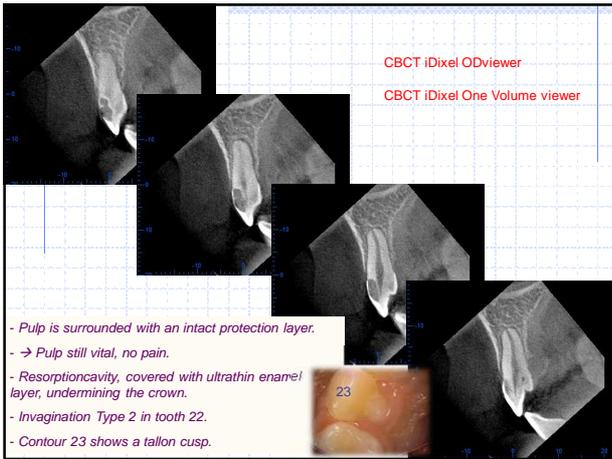
Fronttooth.  
Orthodontics  
PCRRS  
Extraction

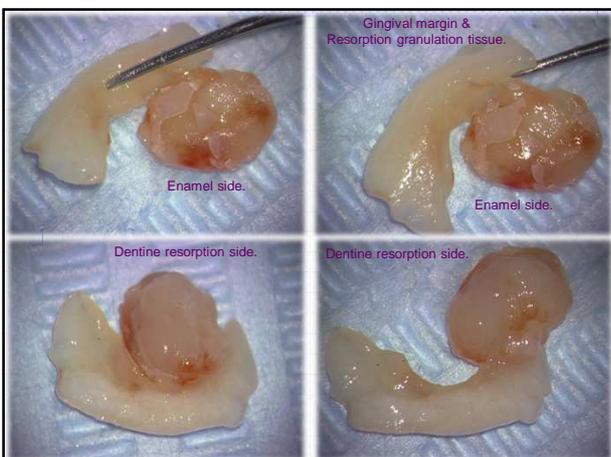
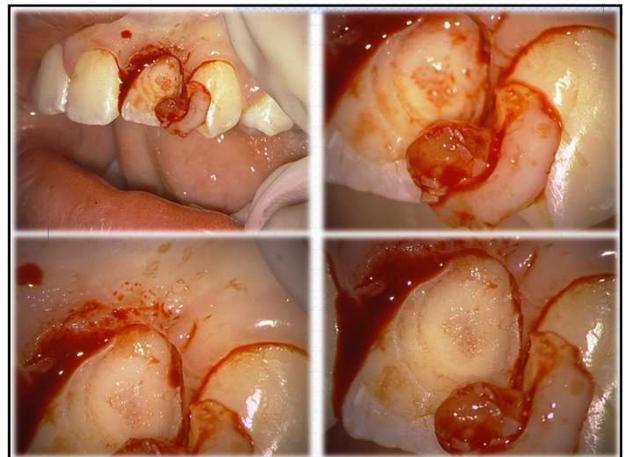
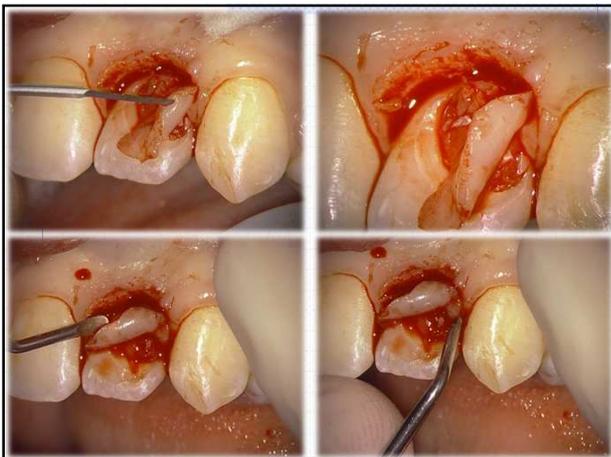
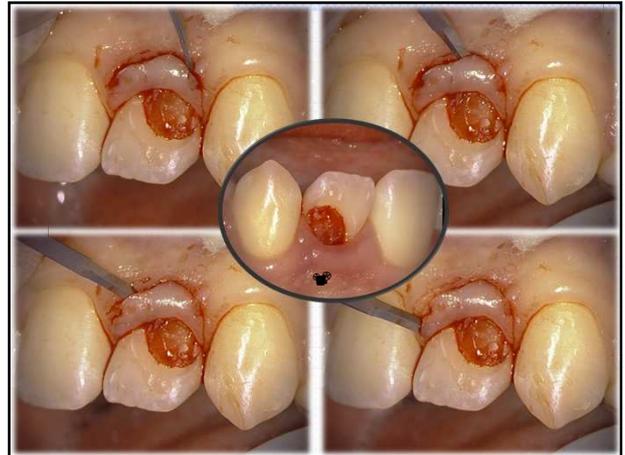


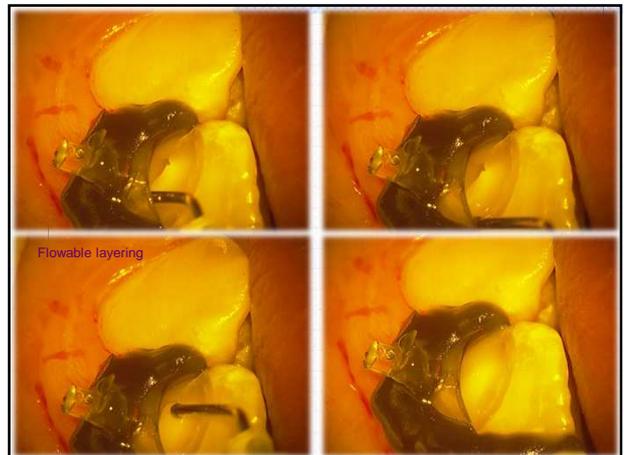
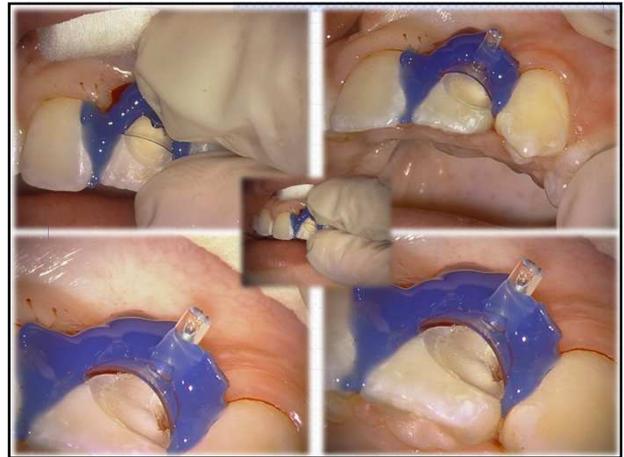
Fronttooth.  
Orthodontics  
Keep vital

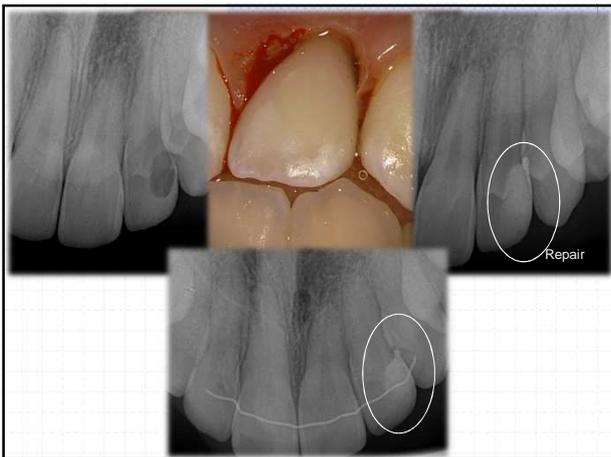
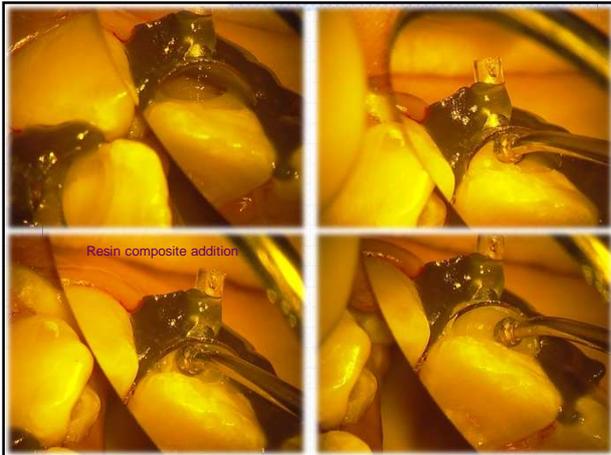


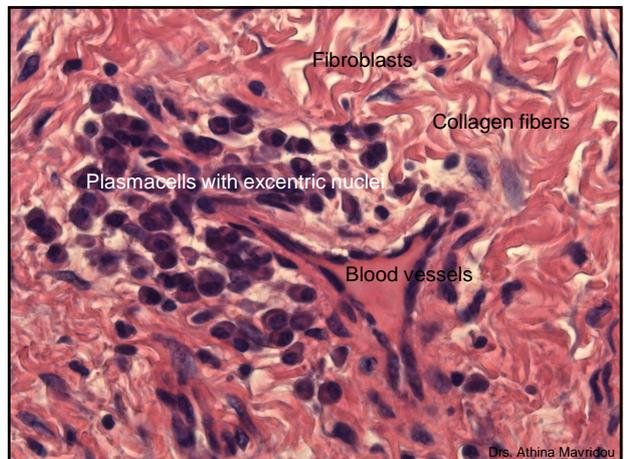
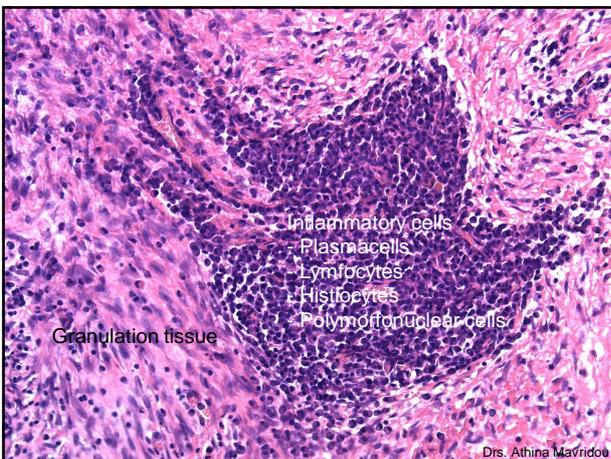
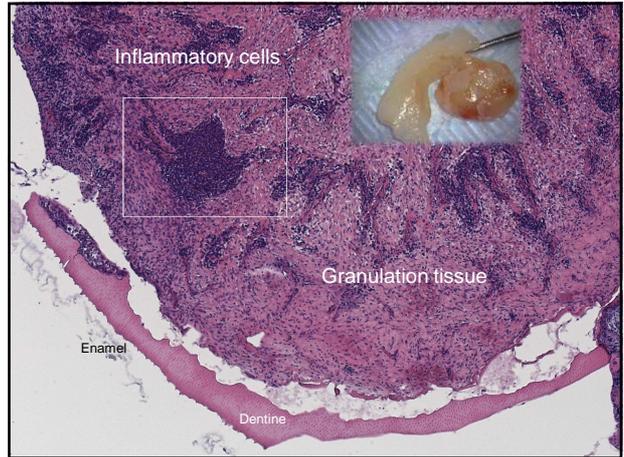


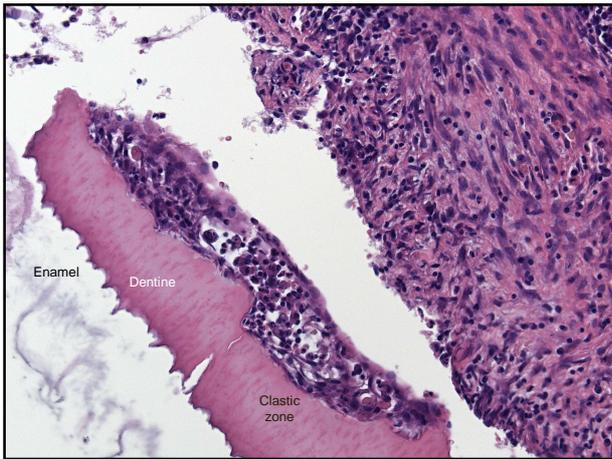




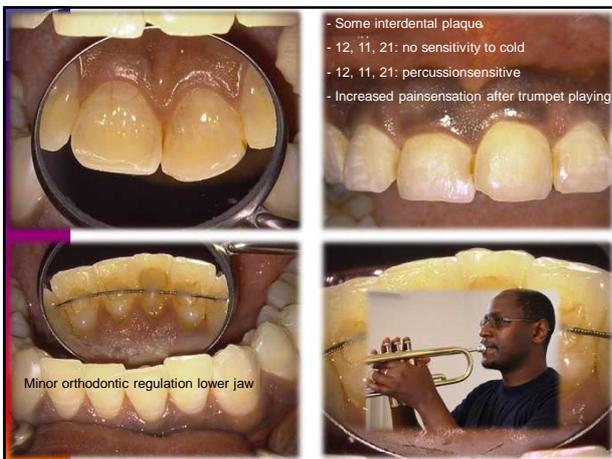








Fronttooth.  
Musicinstruments  
Trumpet  
Waifull watching



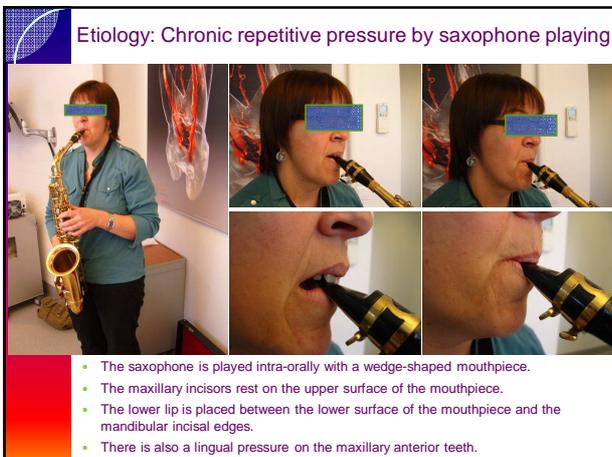
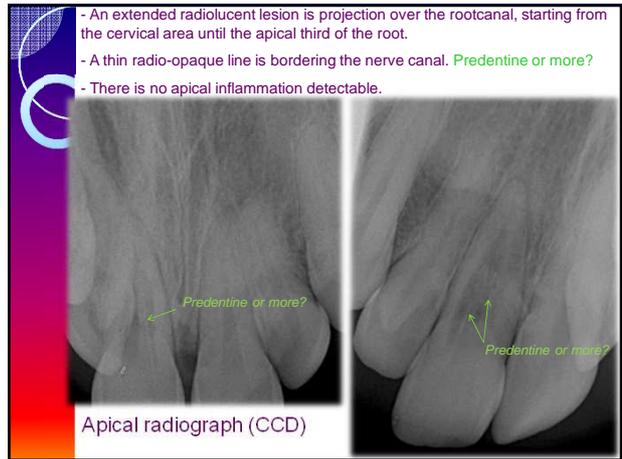
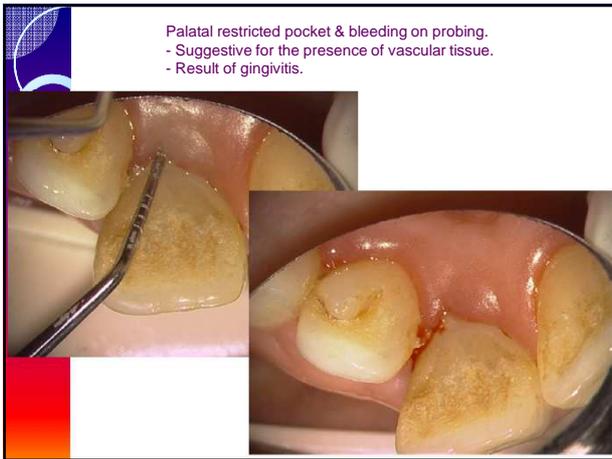
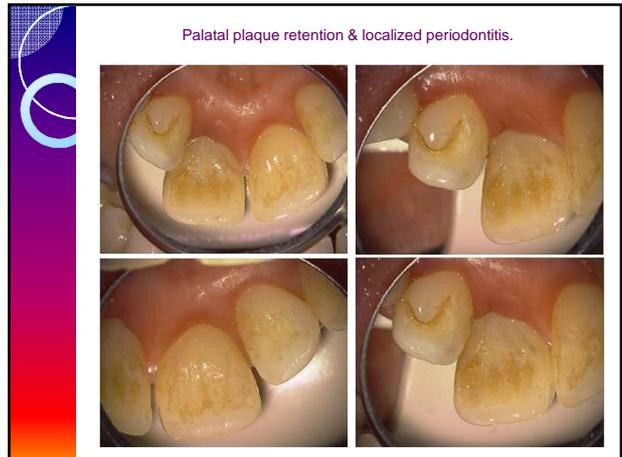
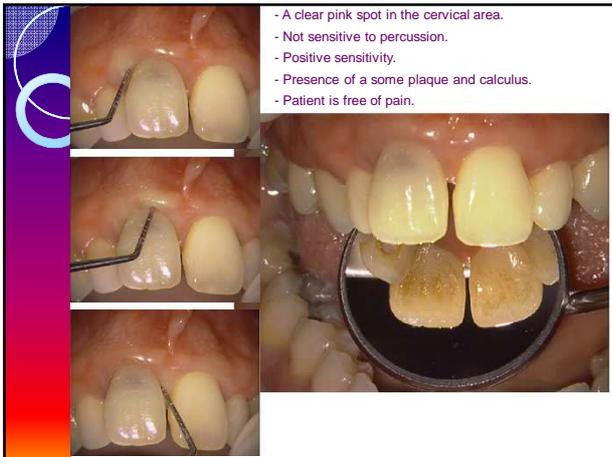


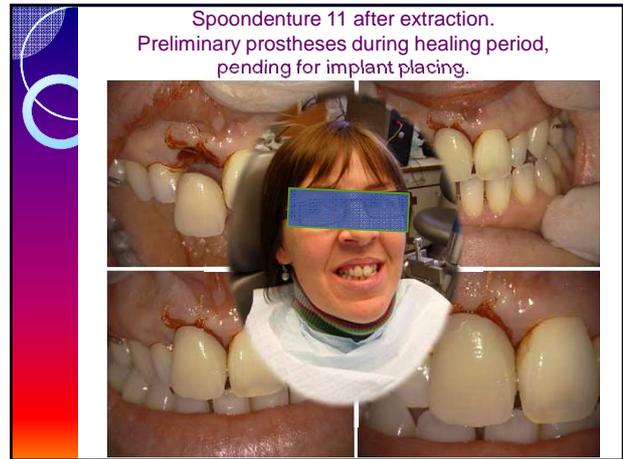
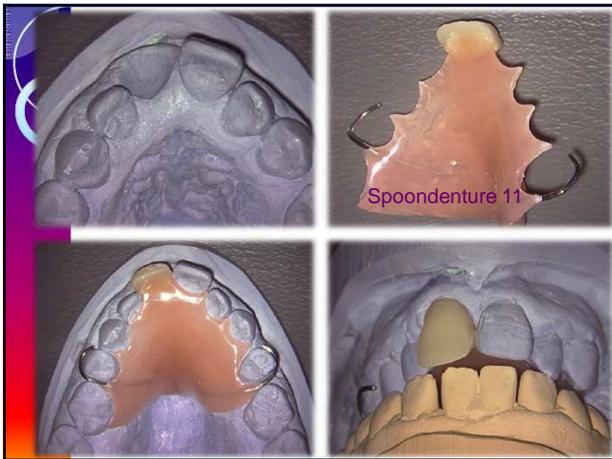
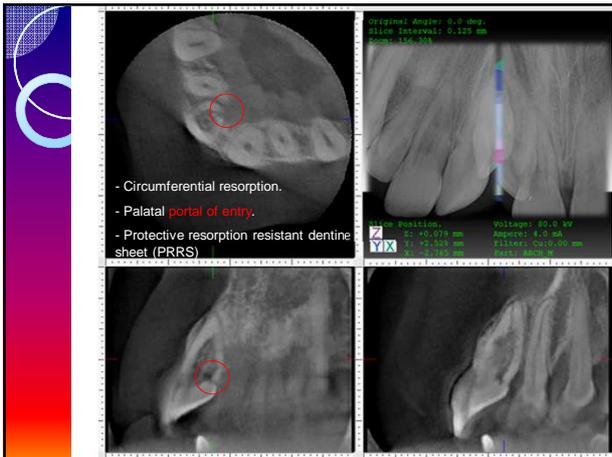
- Tongue pressure against frontteeth.
- Repetitive Trumpet/Lip pressure for long periods during several years.
- Tilting moment cervical fulcrum.
- Orthodontic treatment at yougthime which induced initial cementum damage.
- Activation of osteoclast + -blastocylus for dentin resorption and new formation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

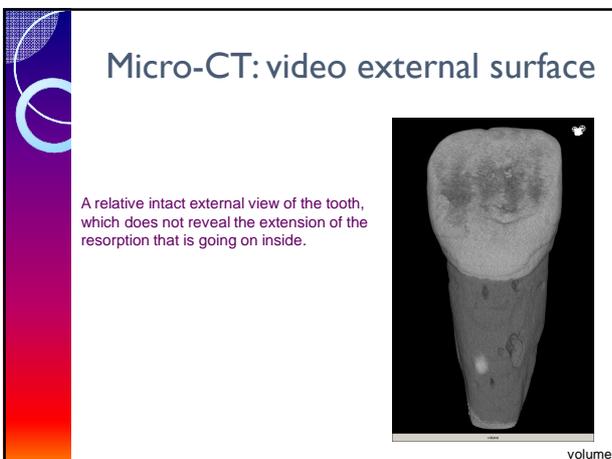
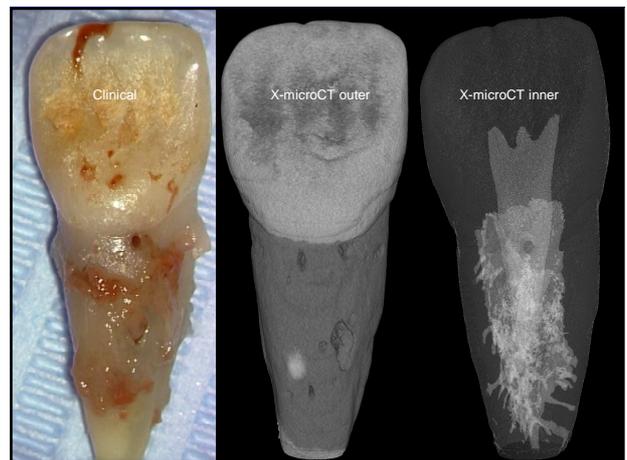
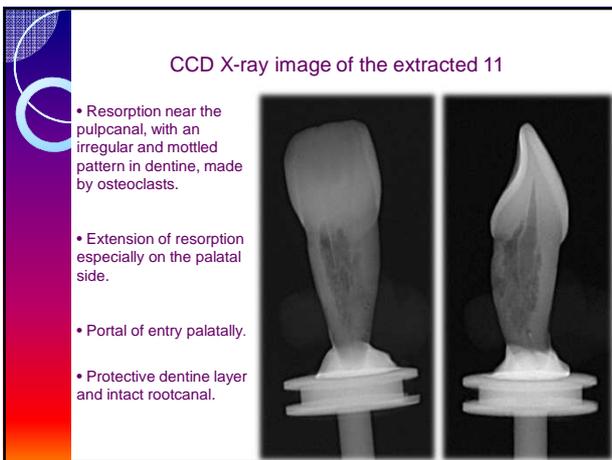


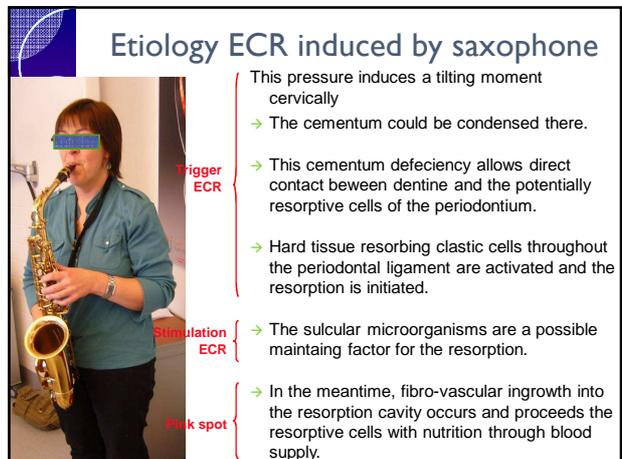
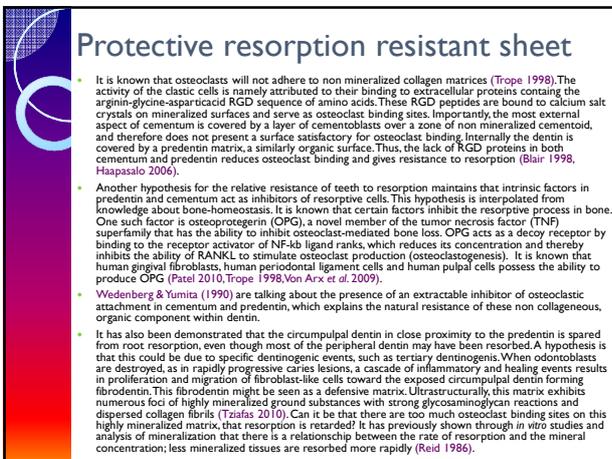
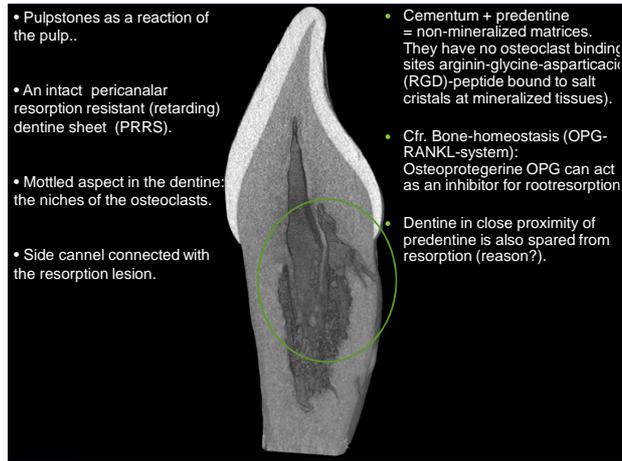
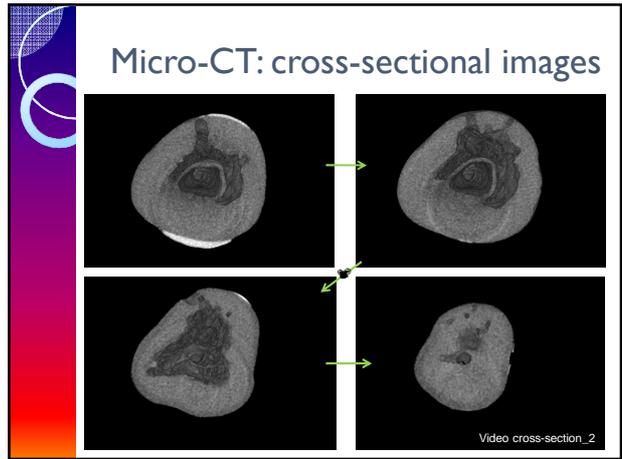
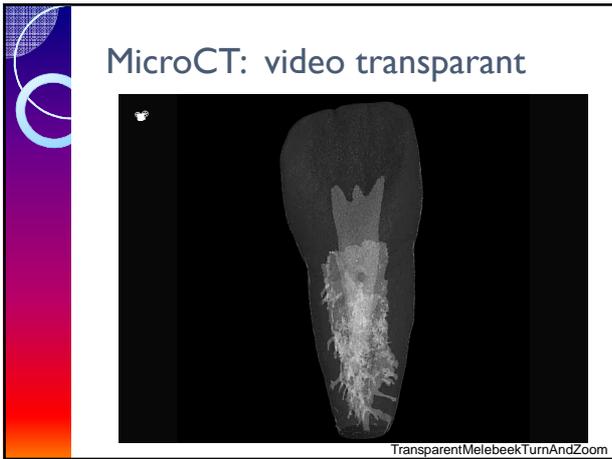
# Fronttooth. Musicinstruments Extraction X-MicroCT

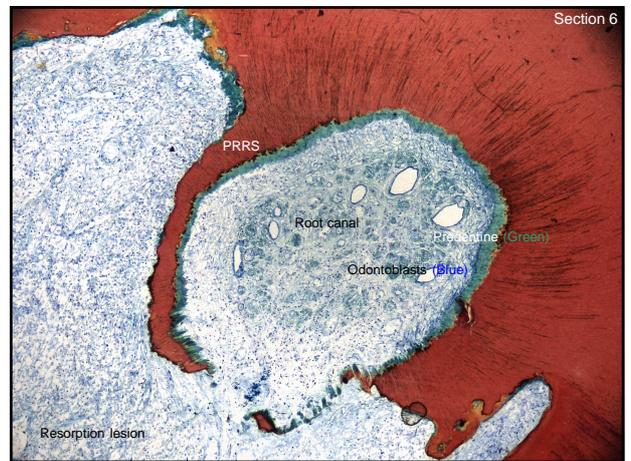
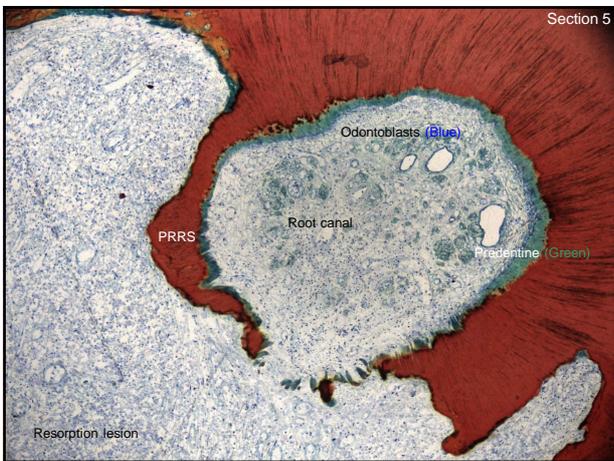
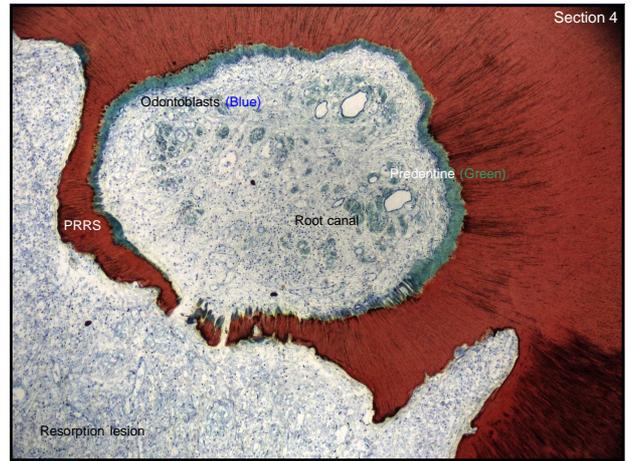
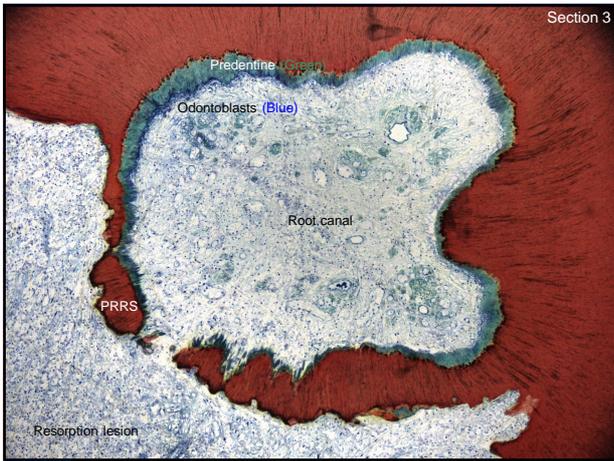
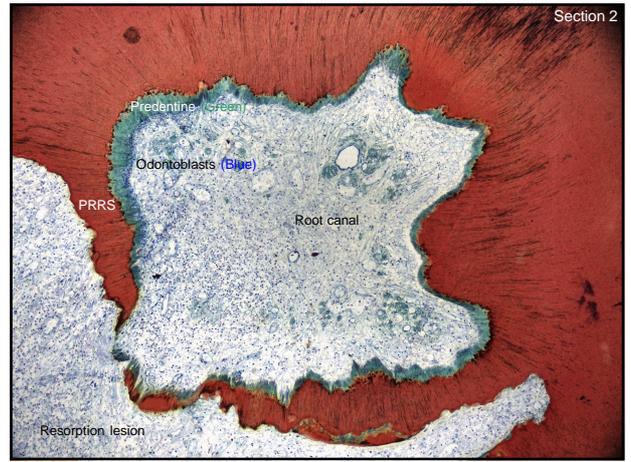
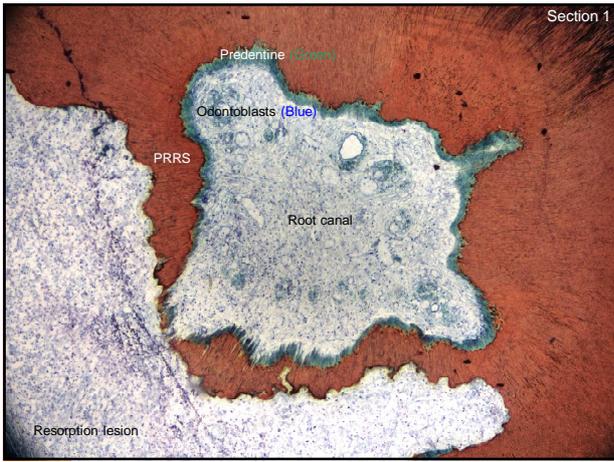


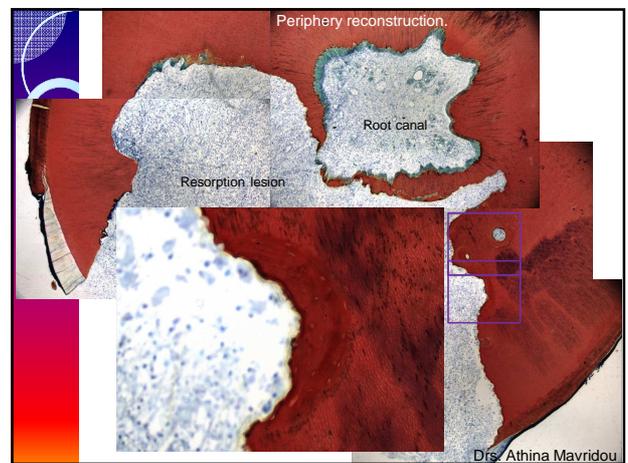
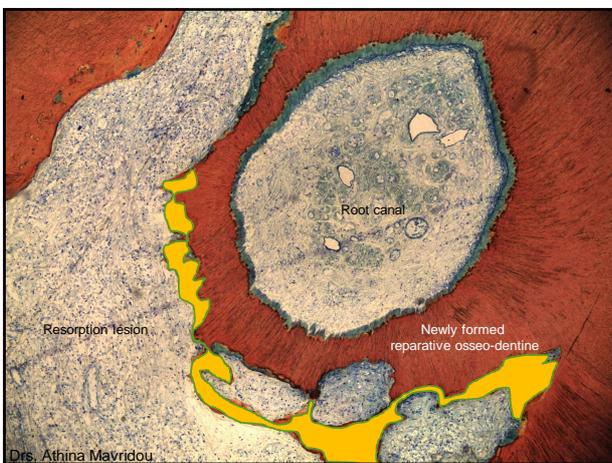
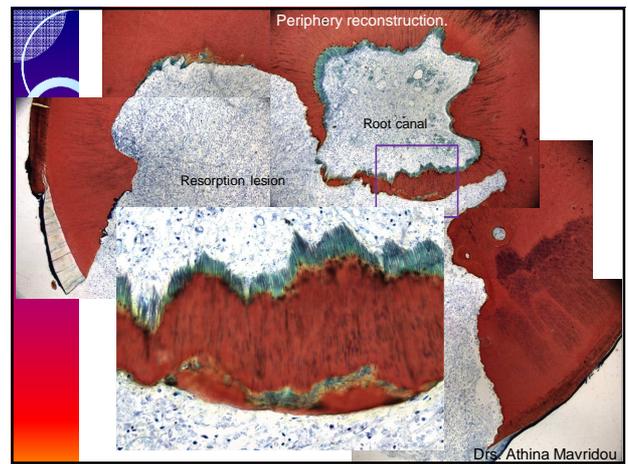
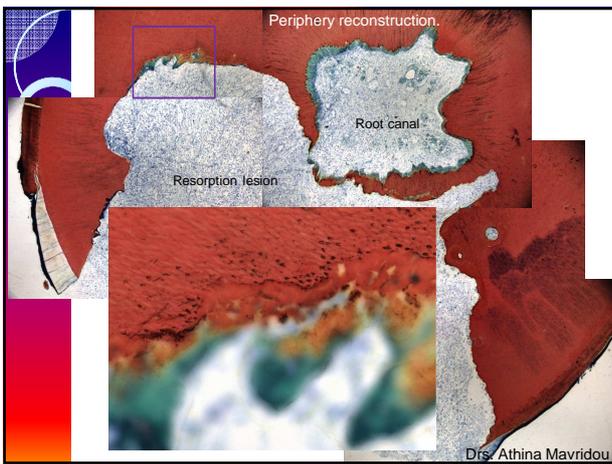
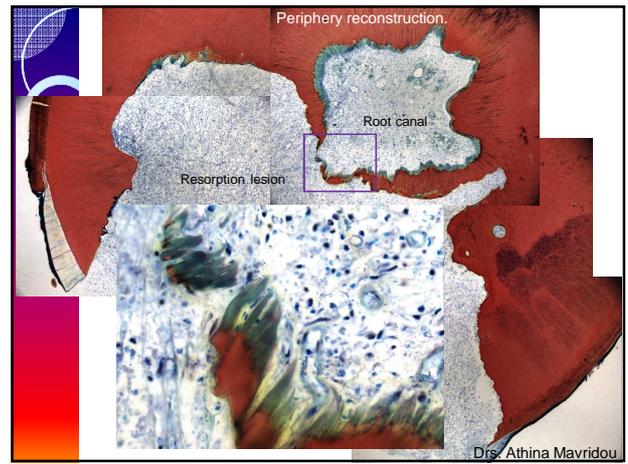
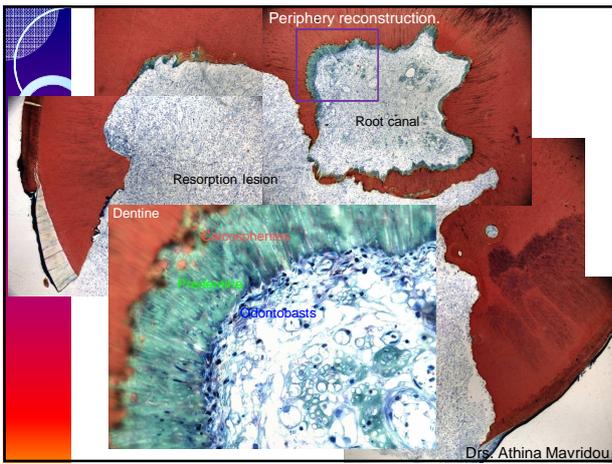












# Premolar. Orthodontics Extraction X-MicroCT

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 anamnesis:**

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

**Clinical research:**

No symptoms, no pinkspot detectable



Bite-wings on a routine consult



Mottled black lesion in the cervical area of 25

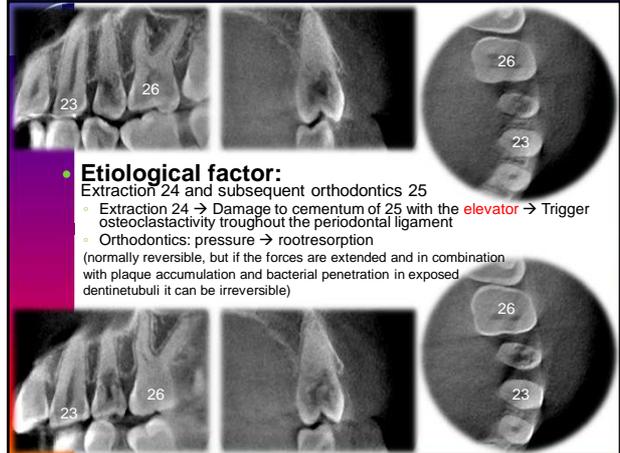
Without careful examination, you can overlook the problem easily.

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



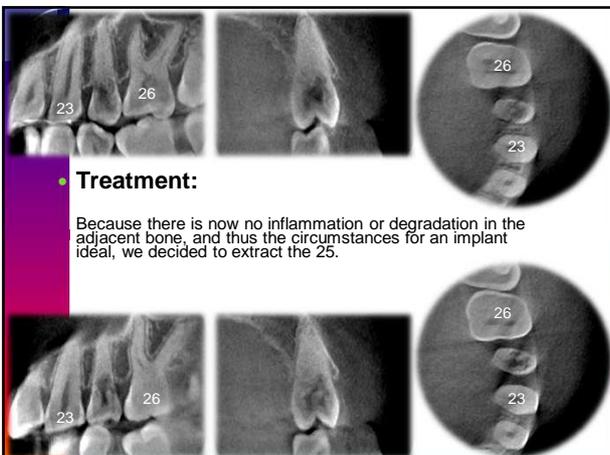
**Etiological factor:**

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:**

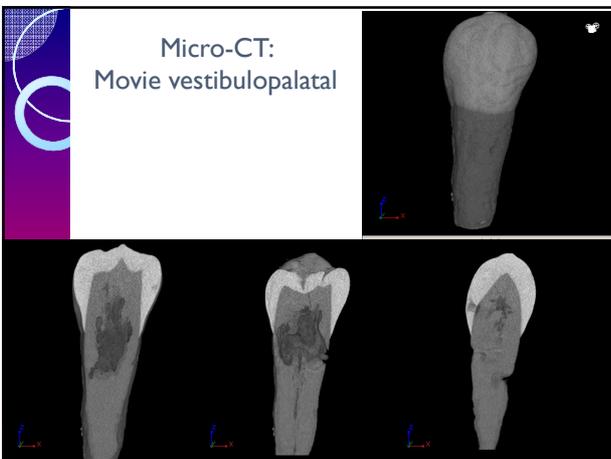
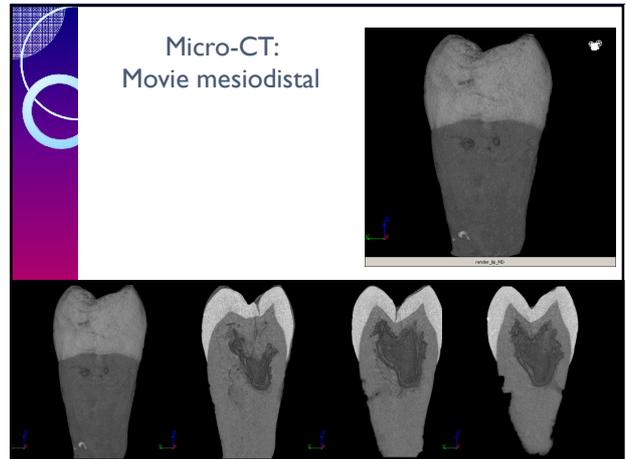
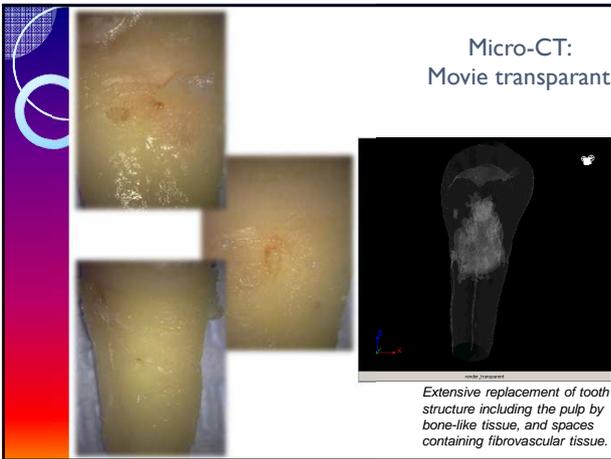
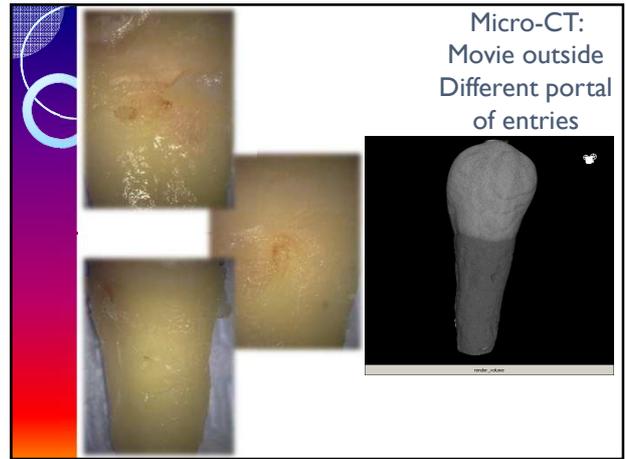
Because there is now no inflammation or degradation in the adjacent bone, and thus the circumstances for an implant ideal, we decided to extract the 25.

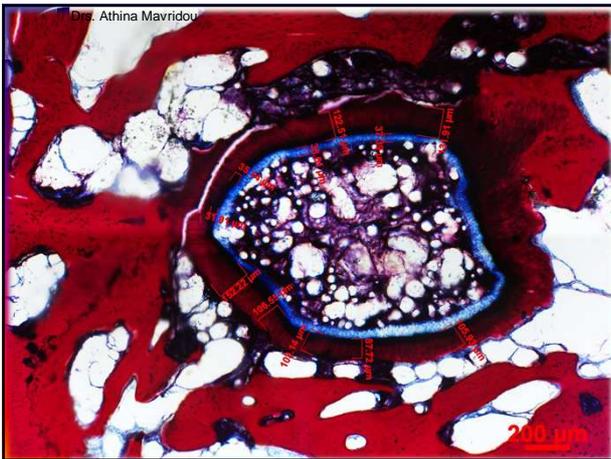
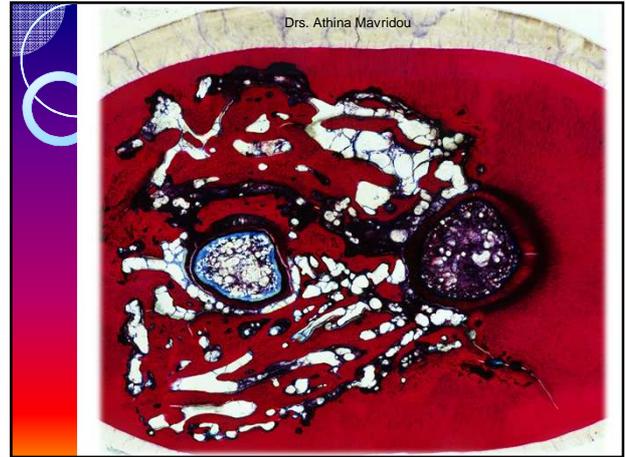
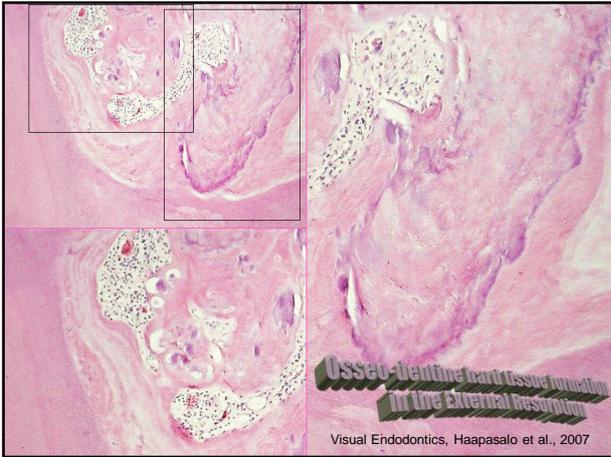


**Clinical view after extraction**

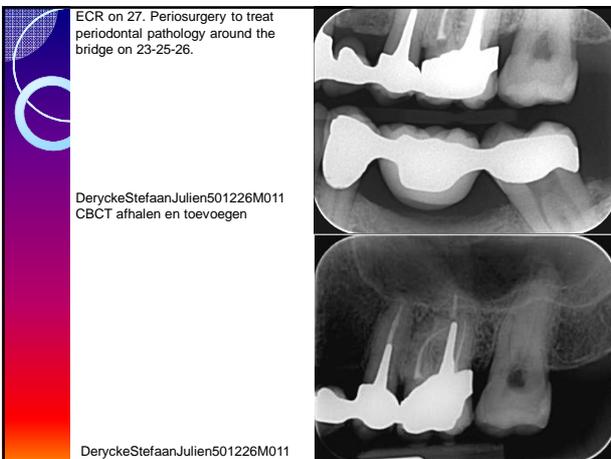


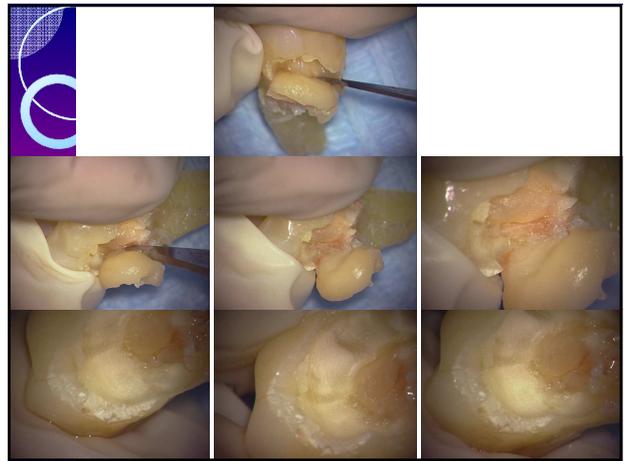
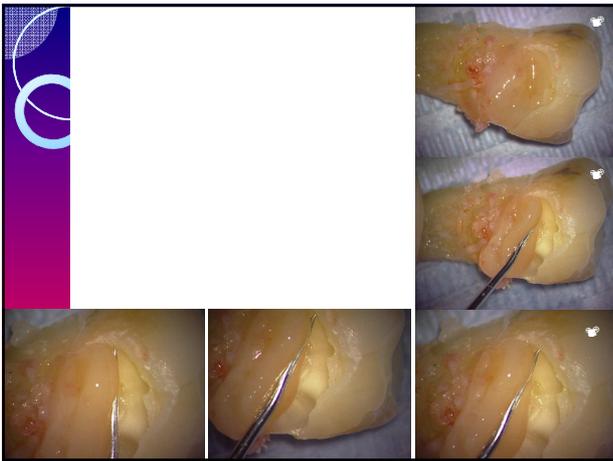
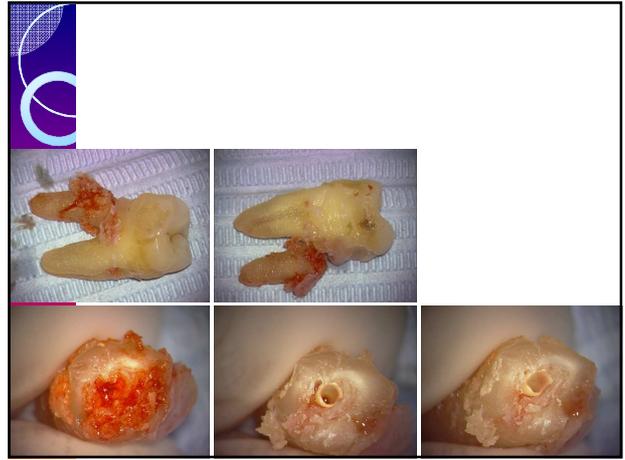
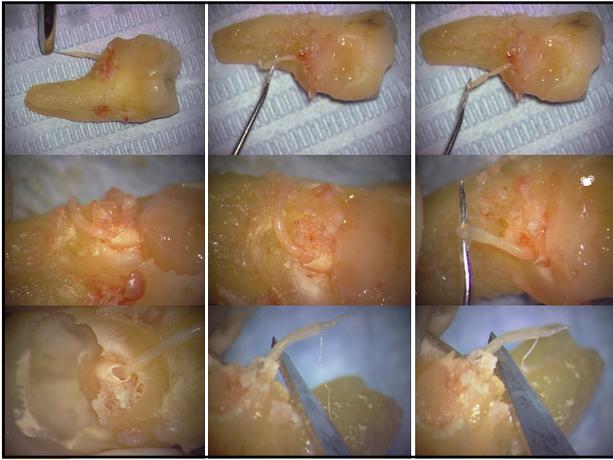
Different little entry cavities (due to orthodontics?)





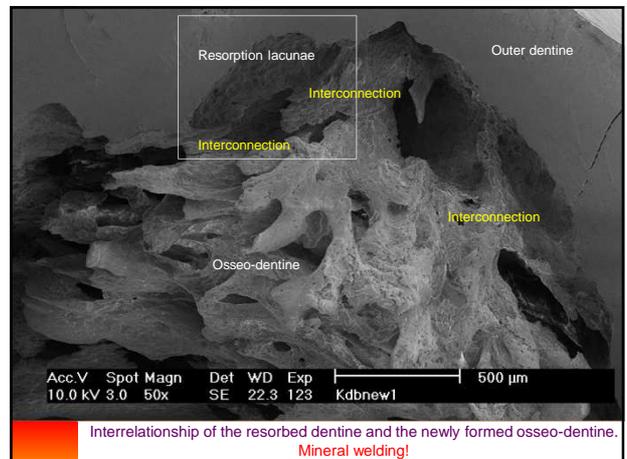
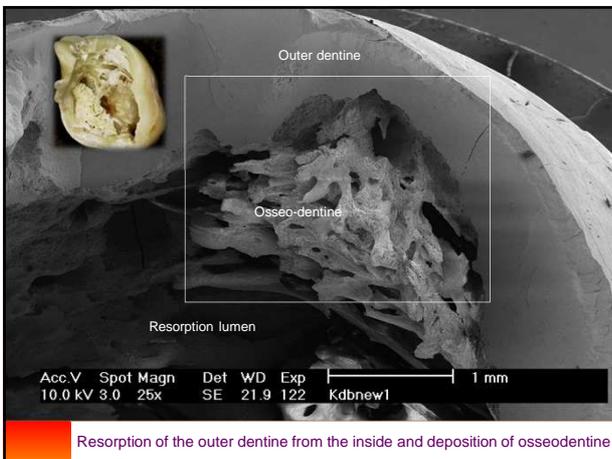
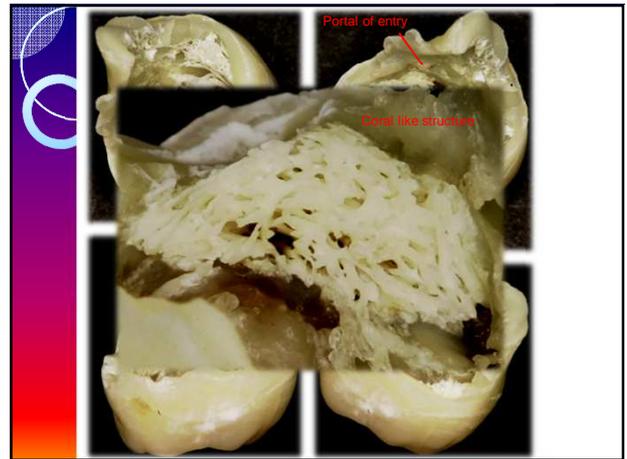
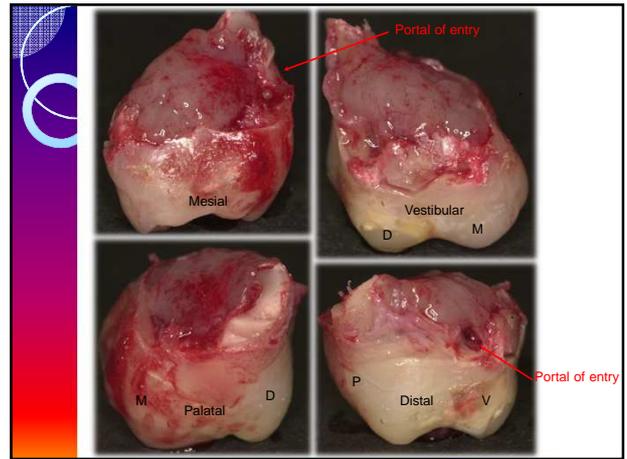
# Molar Periosurgery Extraction

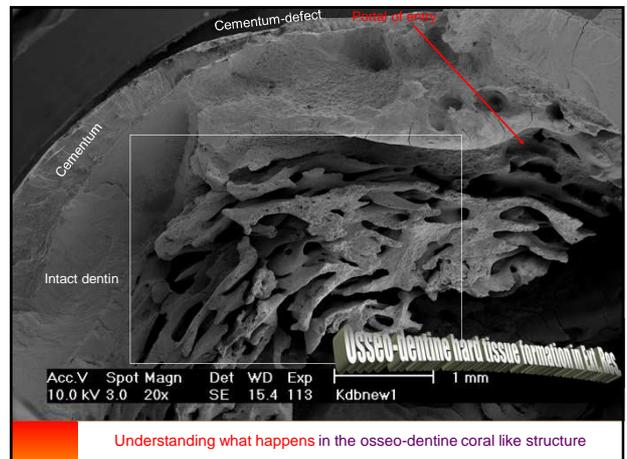
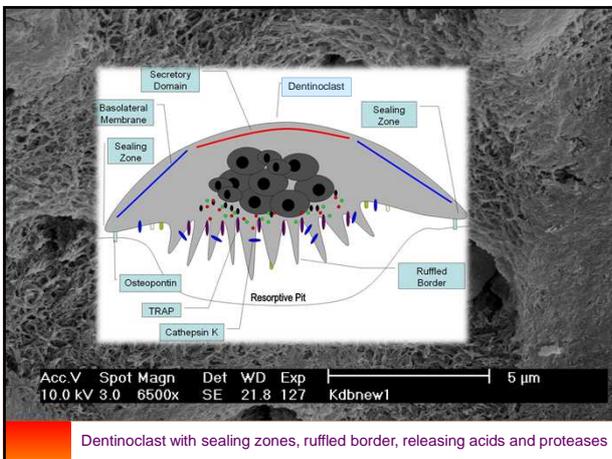
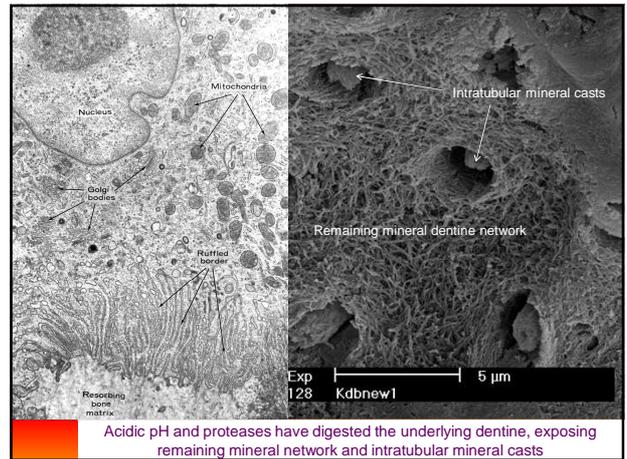
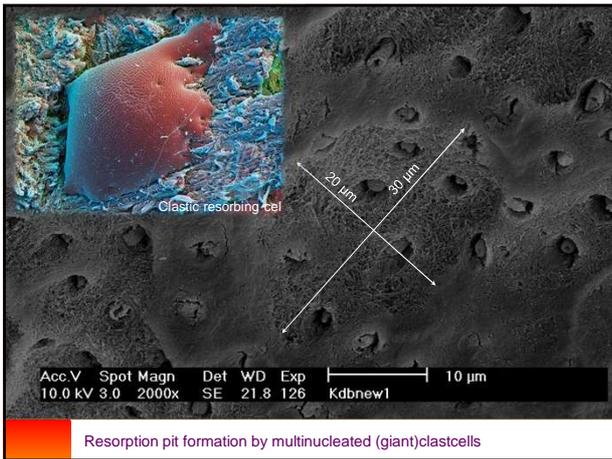
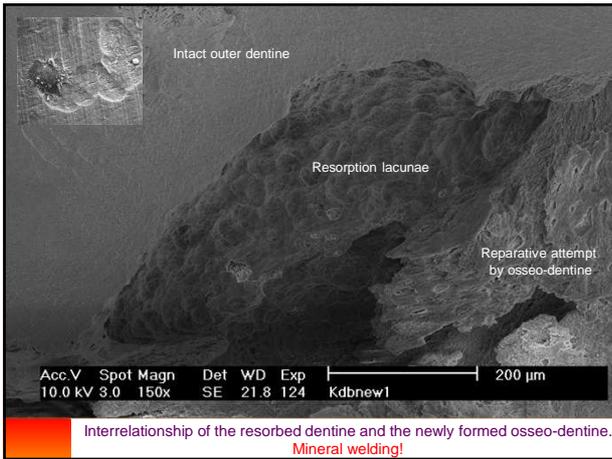


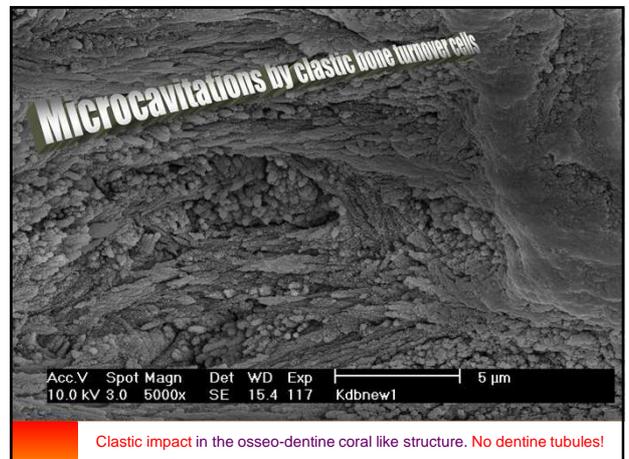
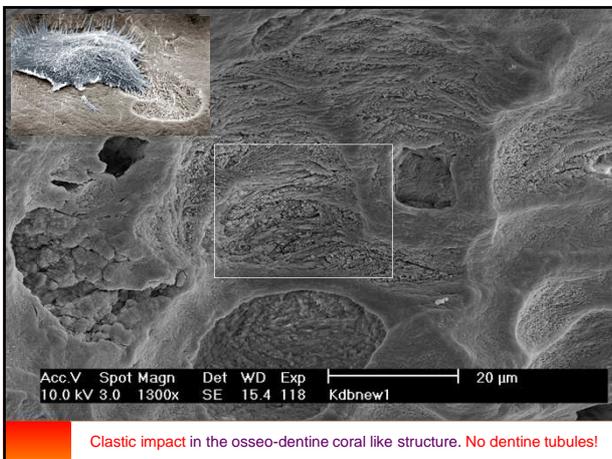
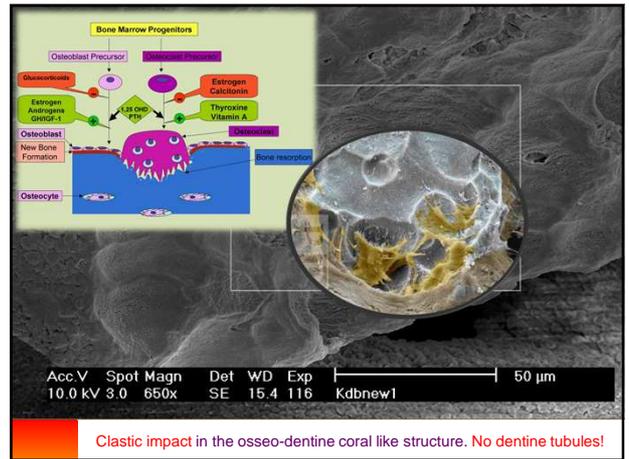
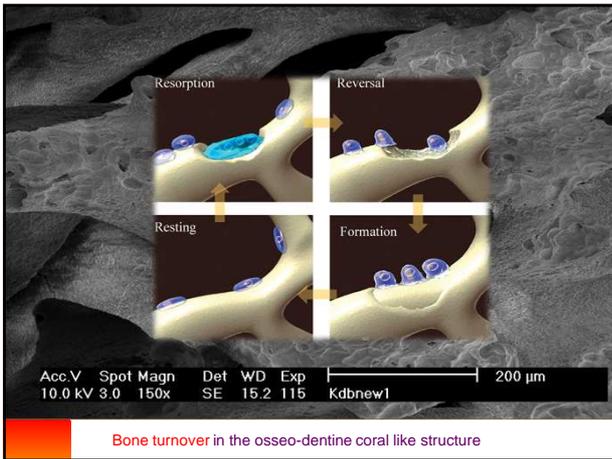
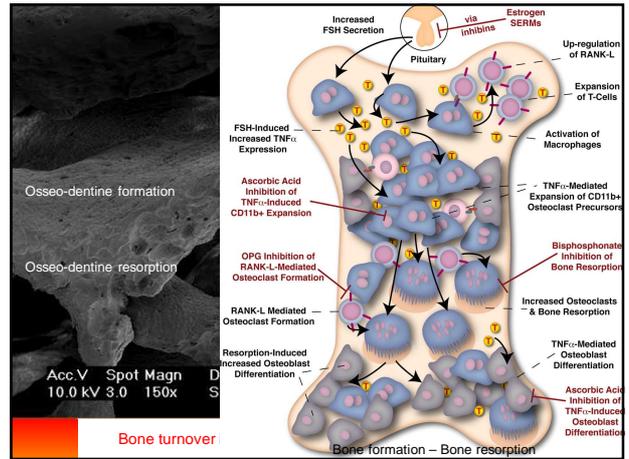


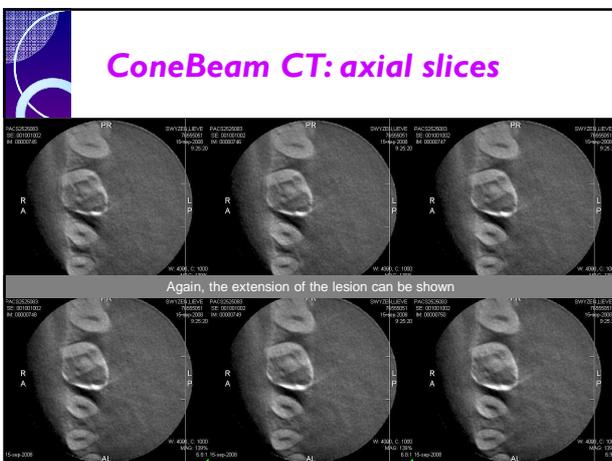
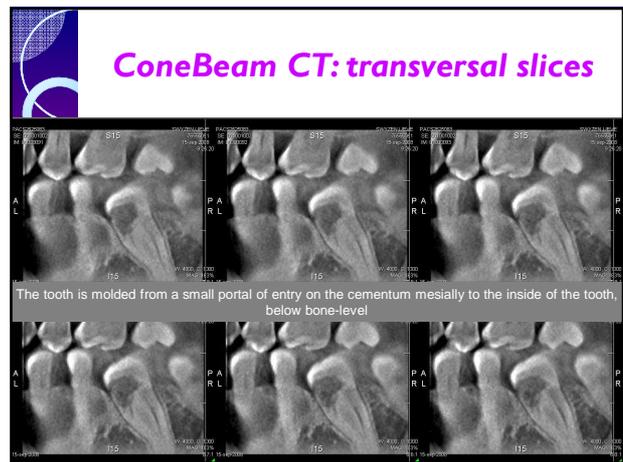
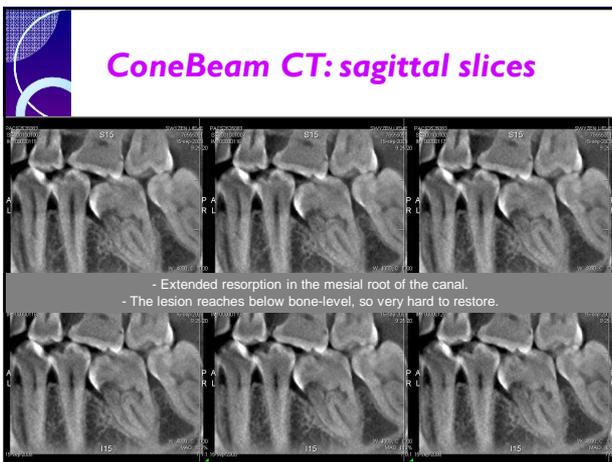
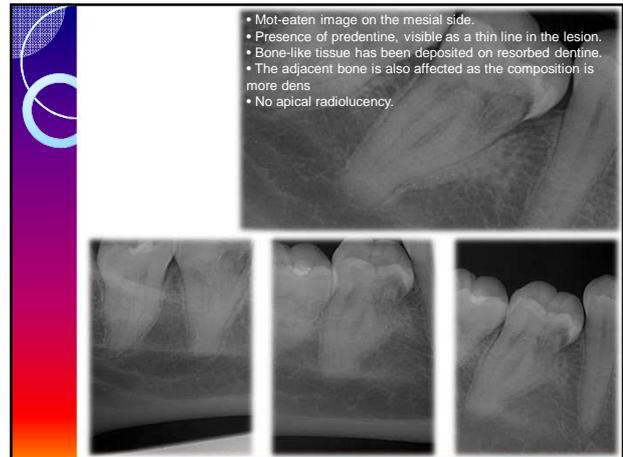
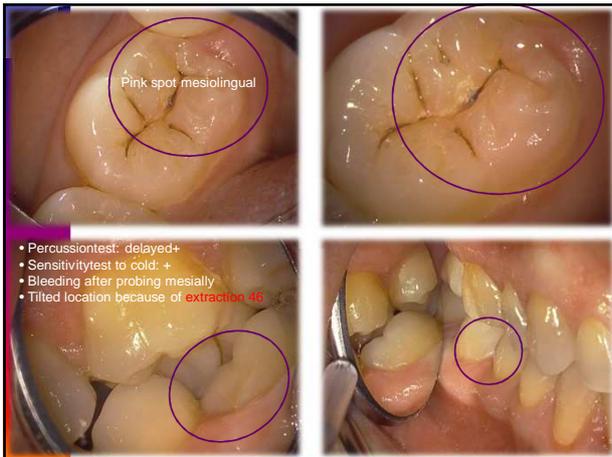
# Molar. Osseodentine Extraction

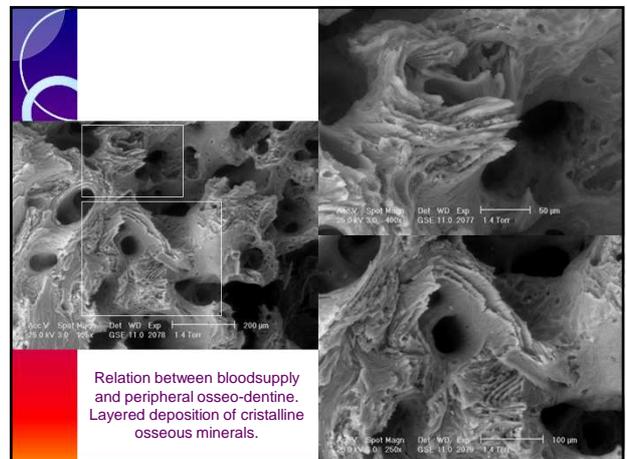
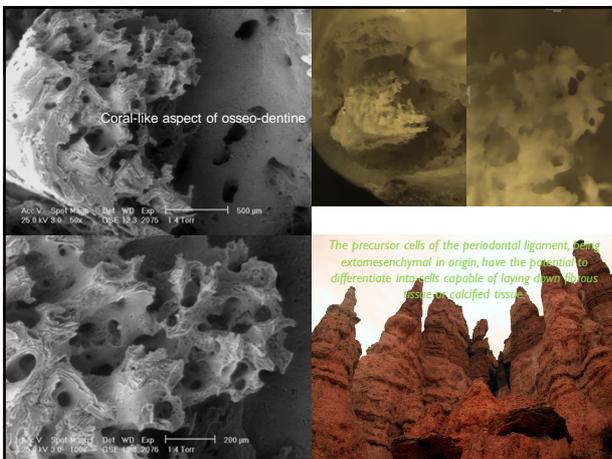
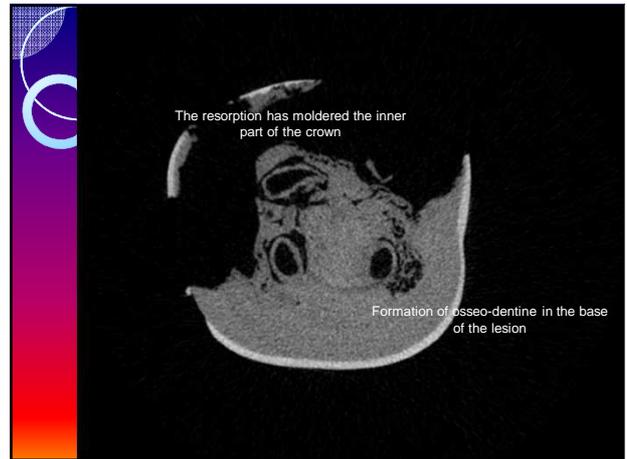
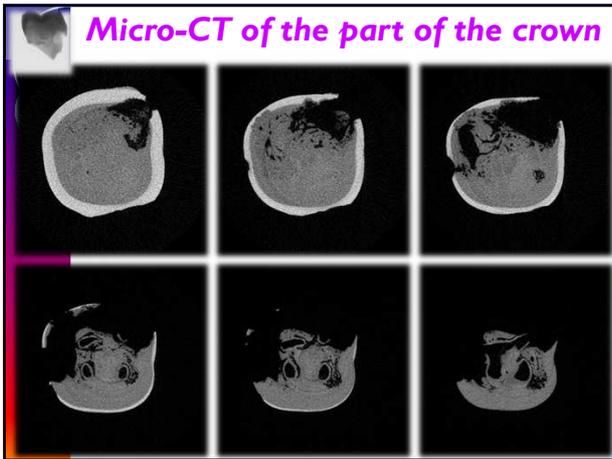
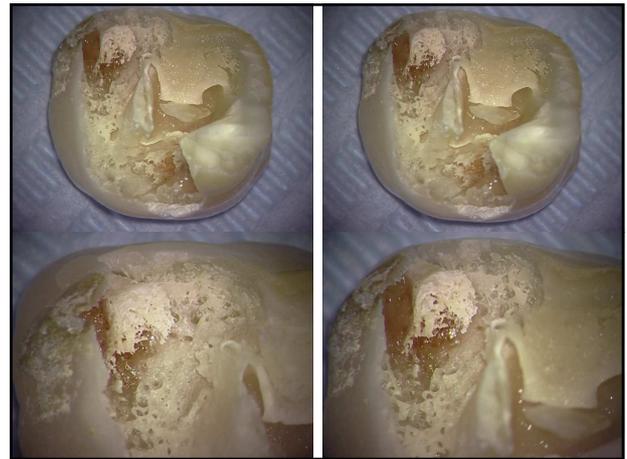


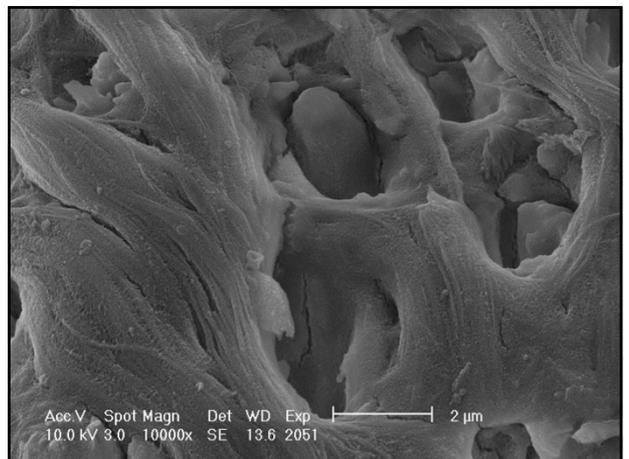
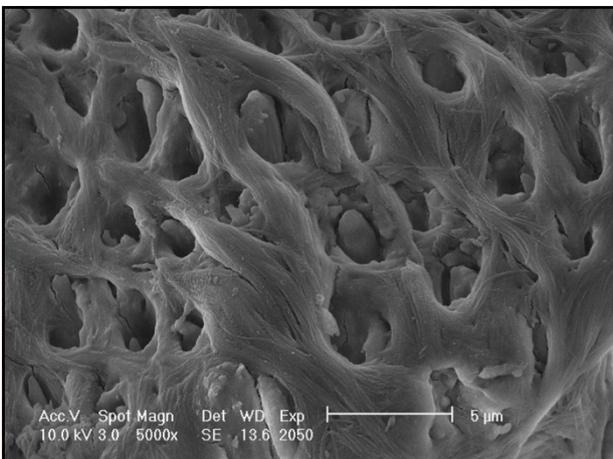
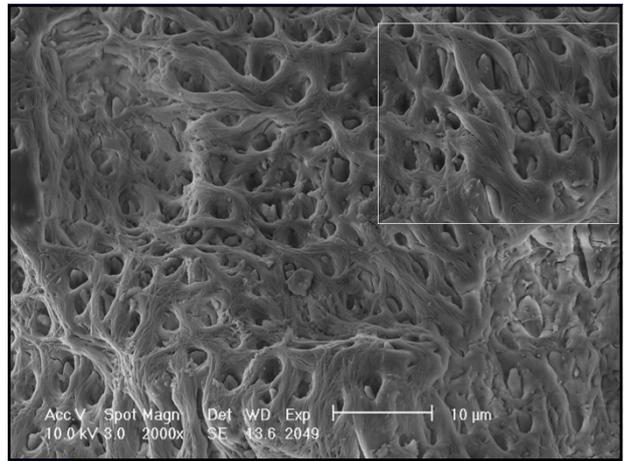
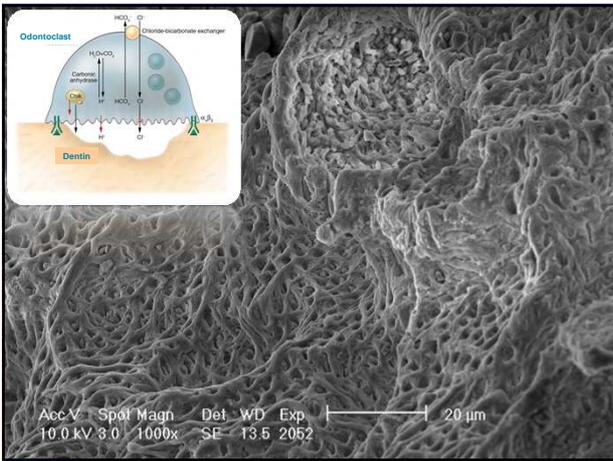
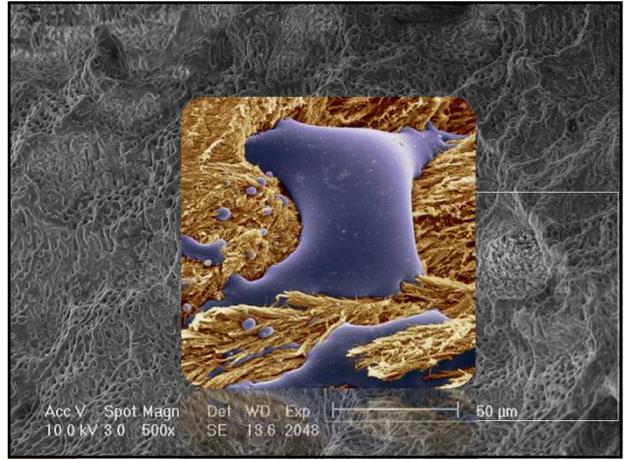
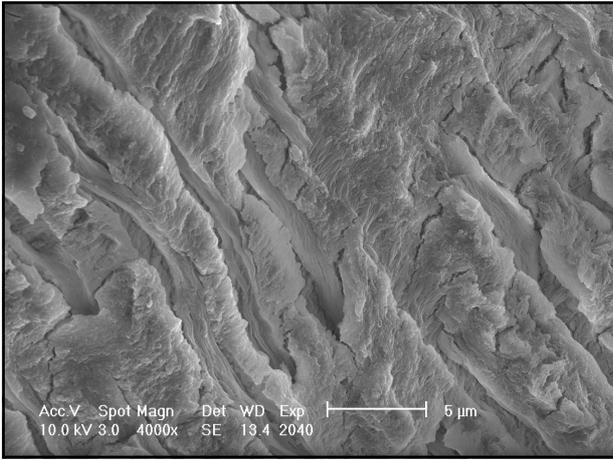


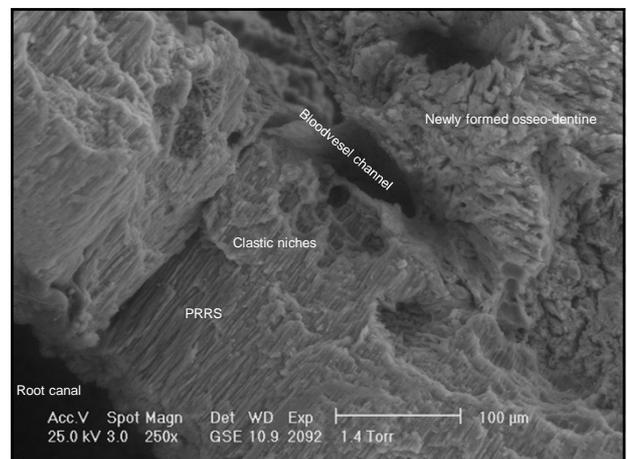
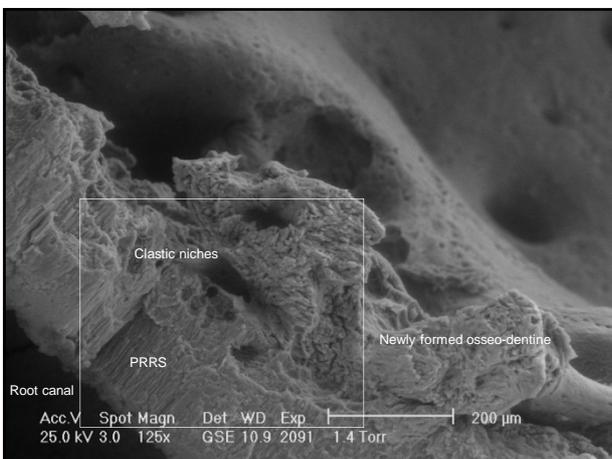
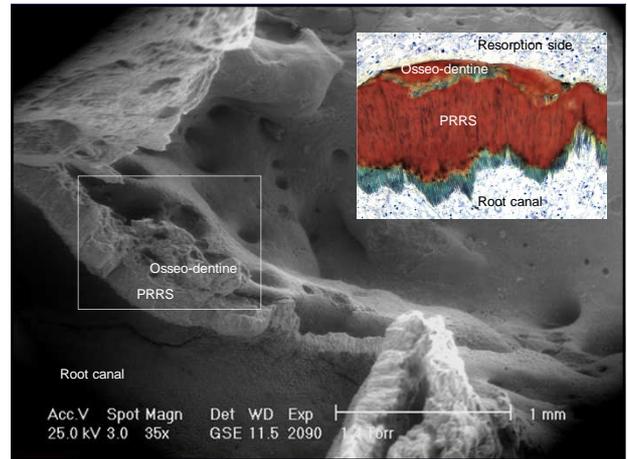
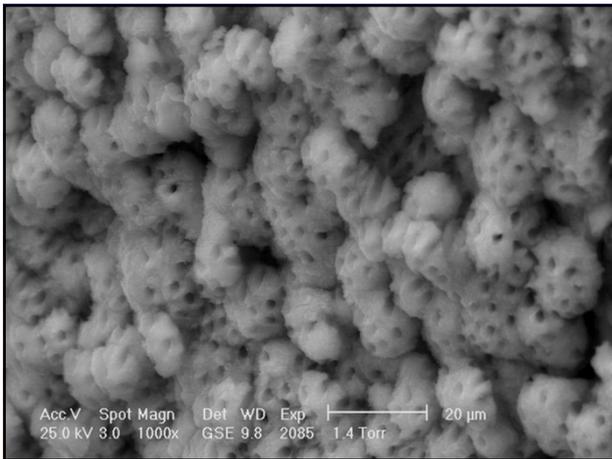
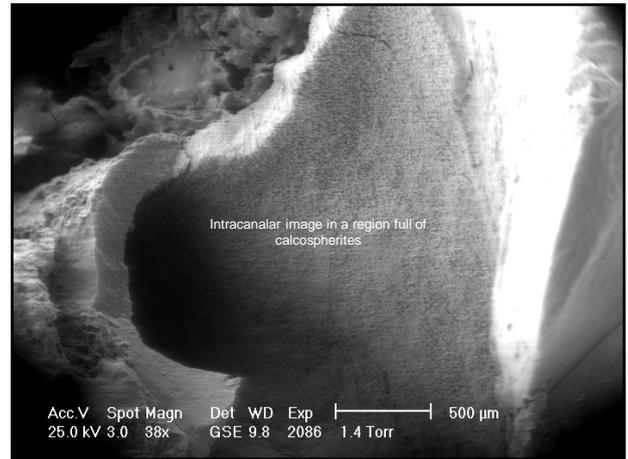
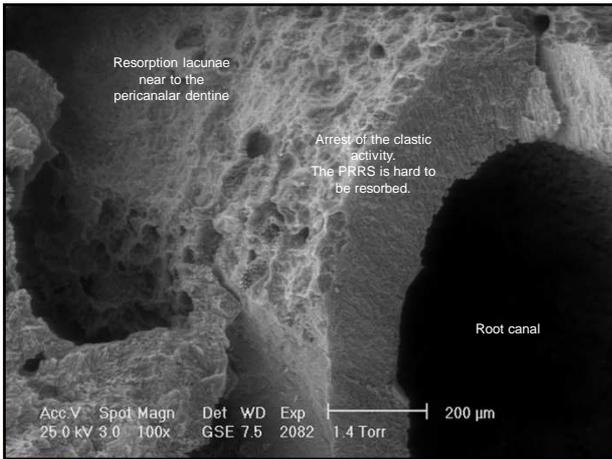


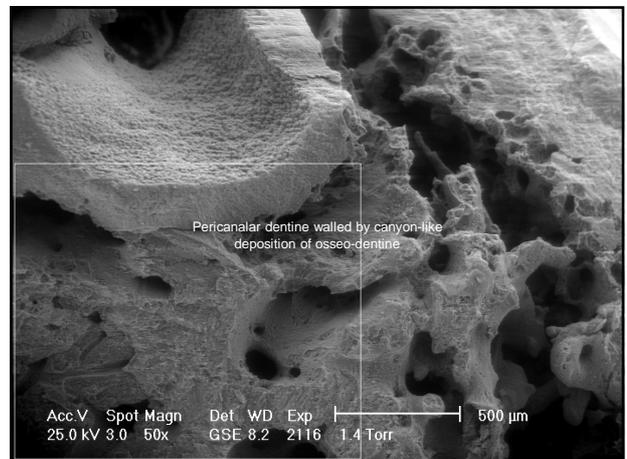
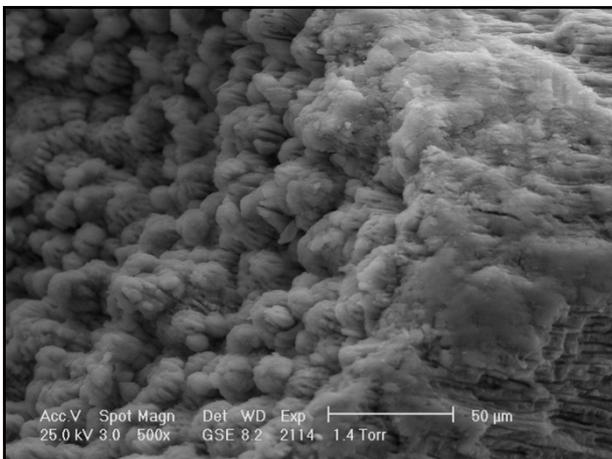
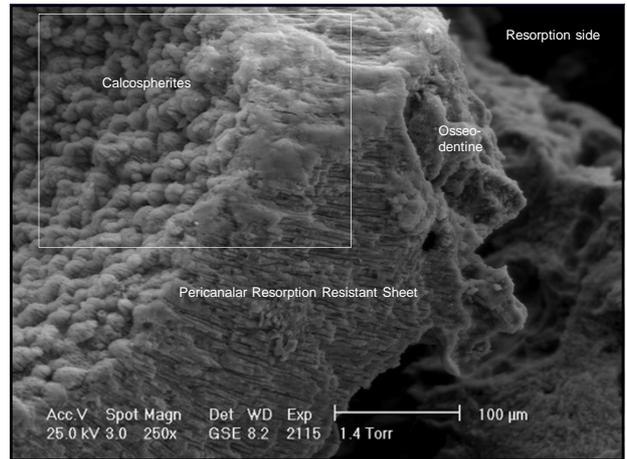
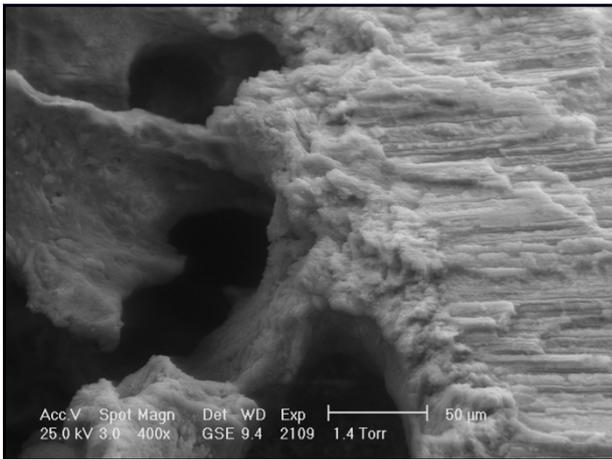
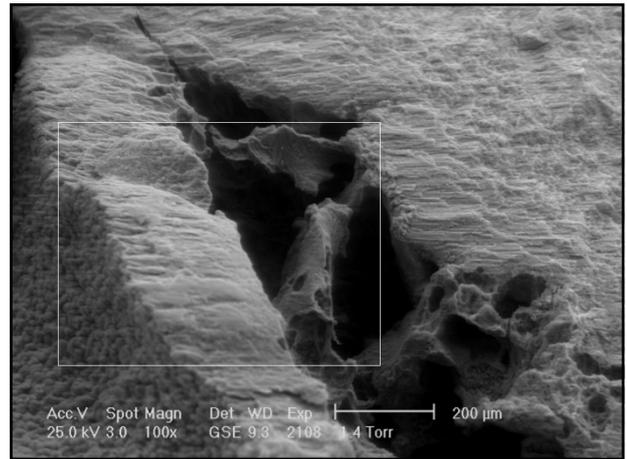
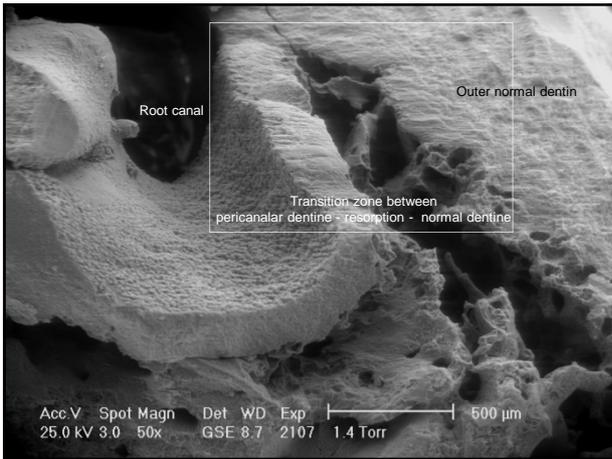


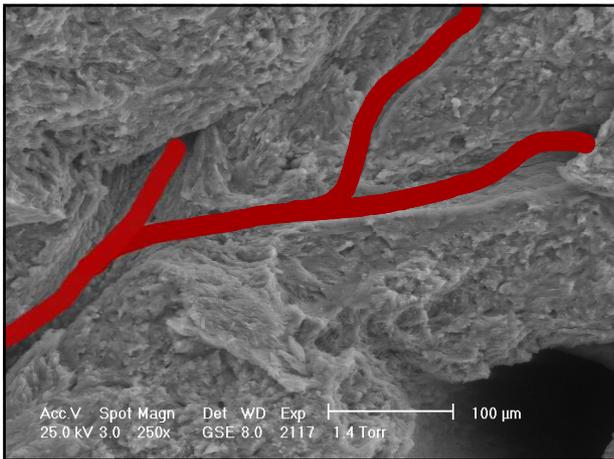
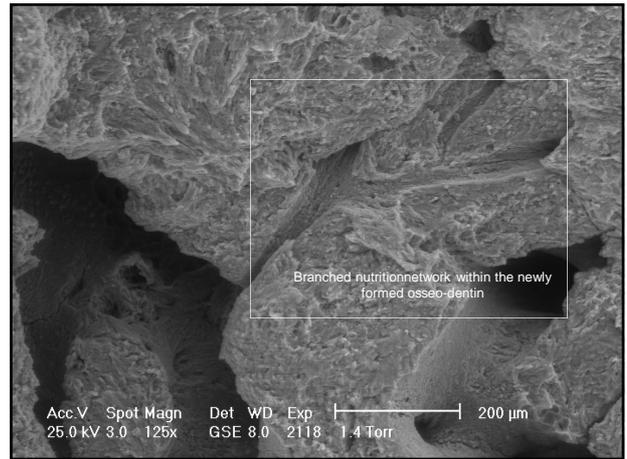
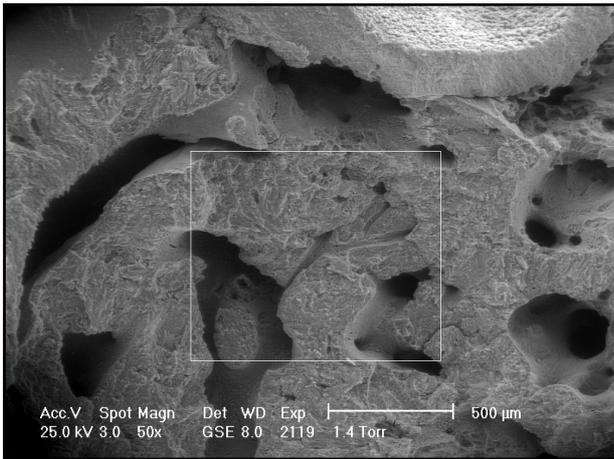












# Molar.

## Extraction damage

## Tilting

## Periodontitis

## Hypoxia

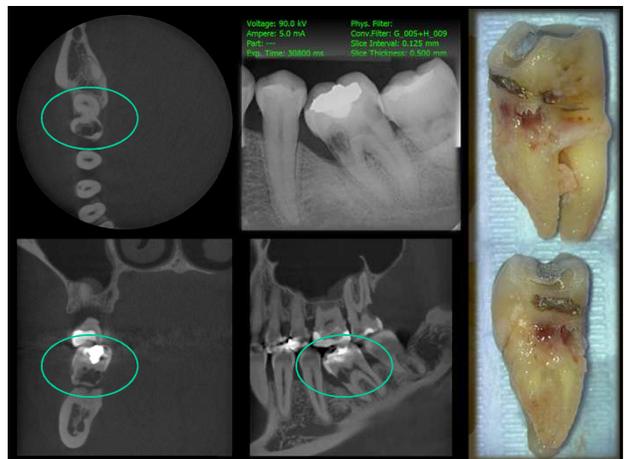
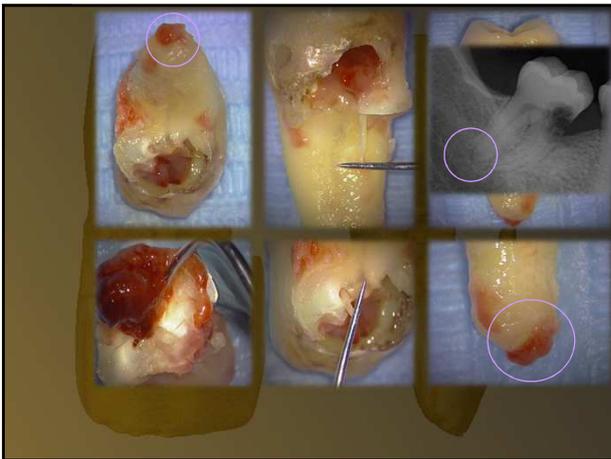
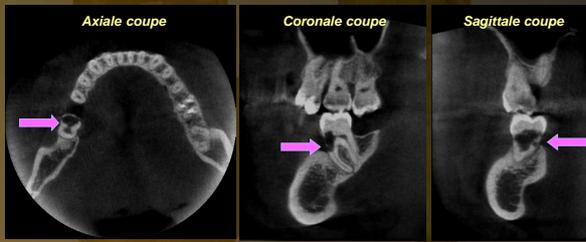


Patient Verslype Frank  
Emdrn: 7011007m086

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

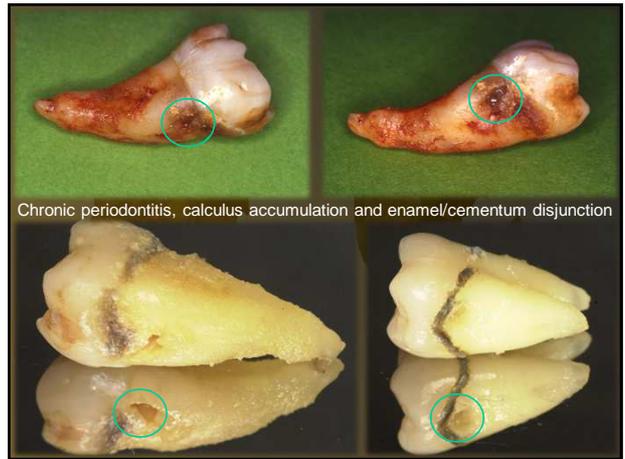
# Specifiek probleem: 47

- Scanora CBCT beelden

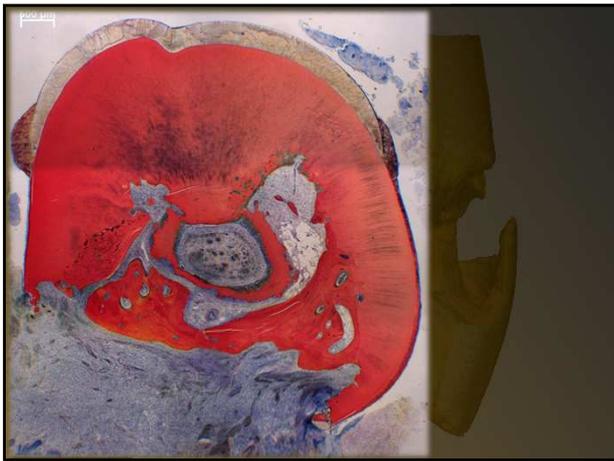




Martin Barco Rosario



Chronic periodontitis, calculus accumulation and enamel/cementum disjunction



2005 versus 2012, 7 years follow-up



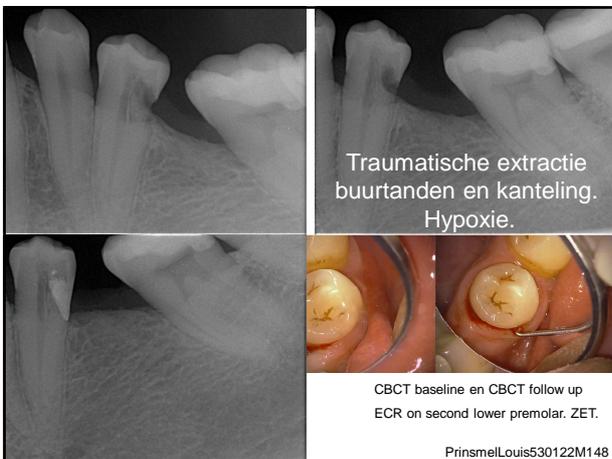
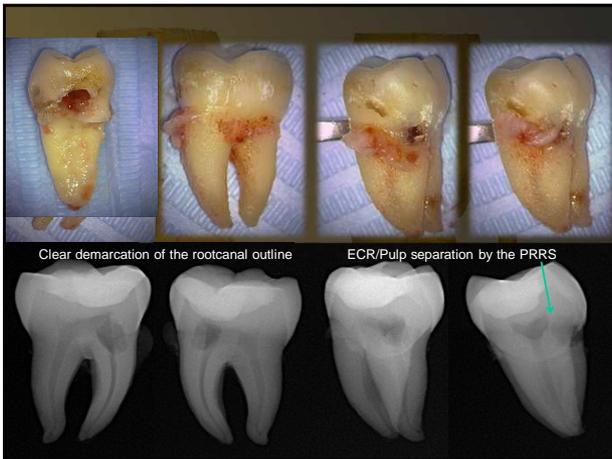
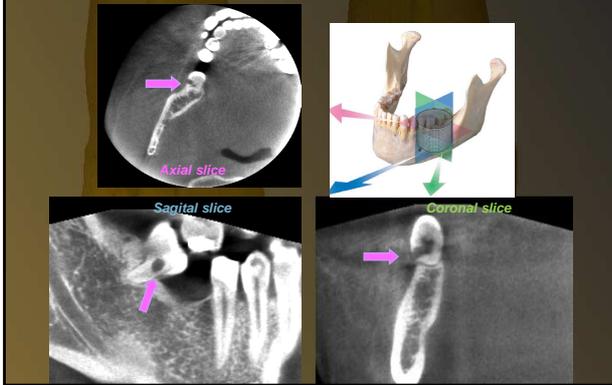
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Pulse: ---  
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Conv. Filter: G\_045Fm\_099  
Slice Interval: 0.125 mm  
Slice Thickness: 3.500 mm

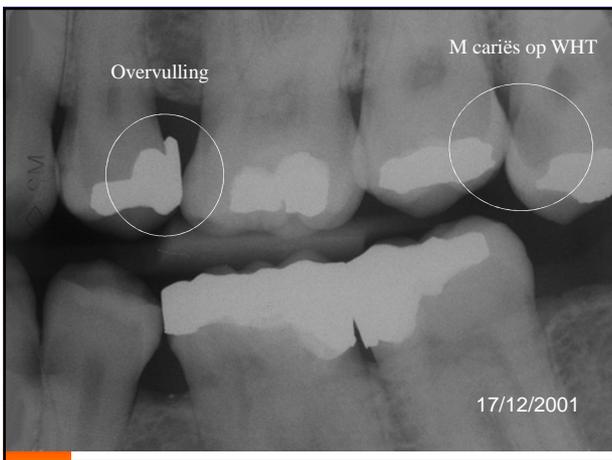
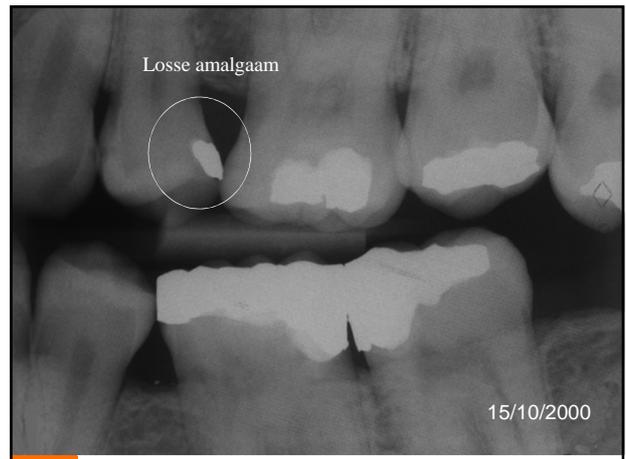
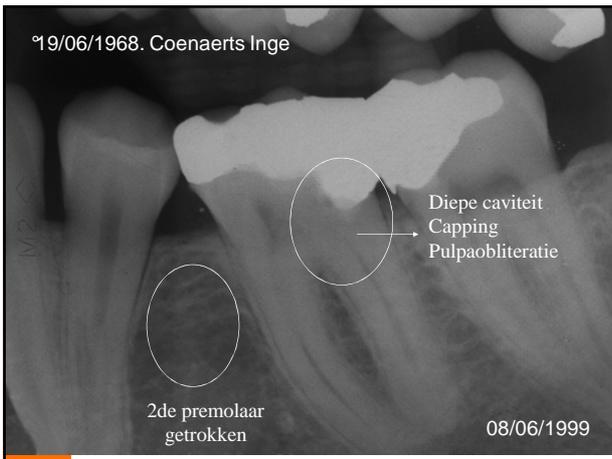


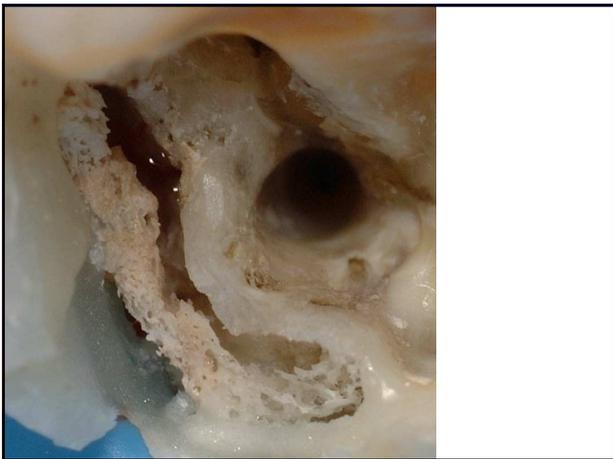
Clijsters Guido

Scanora CBCT-beelden van de 47



Molar.  
Osseodentine  
Infiltration therapy







Molar & premolar  
Cats



### 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- $\kappa$ 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).