

# Clinical and radiographical diagnostics

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EGYETEM 1769

# Introduction

- correct diagnosis is the condition for successful therapy
- localization, extension, seriousness, prognosis of a disease
- diagnosis based treatment plan



# Introduction

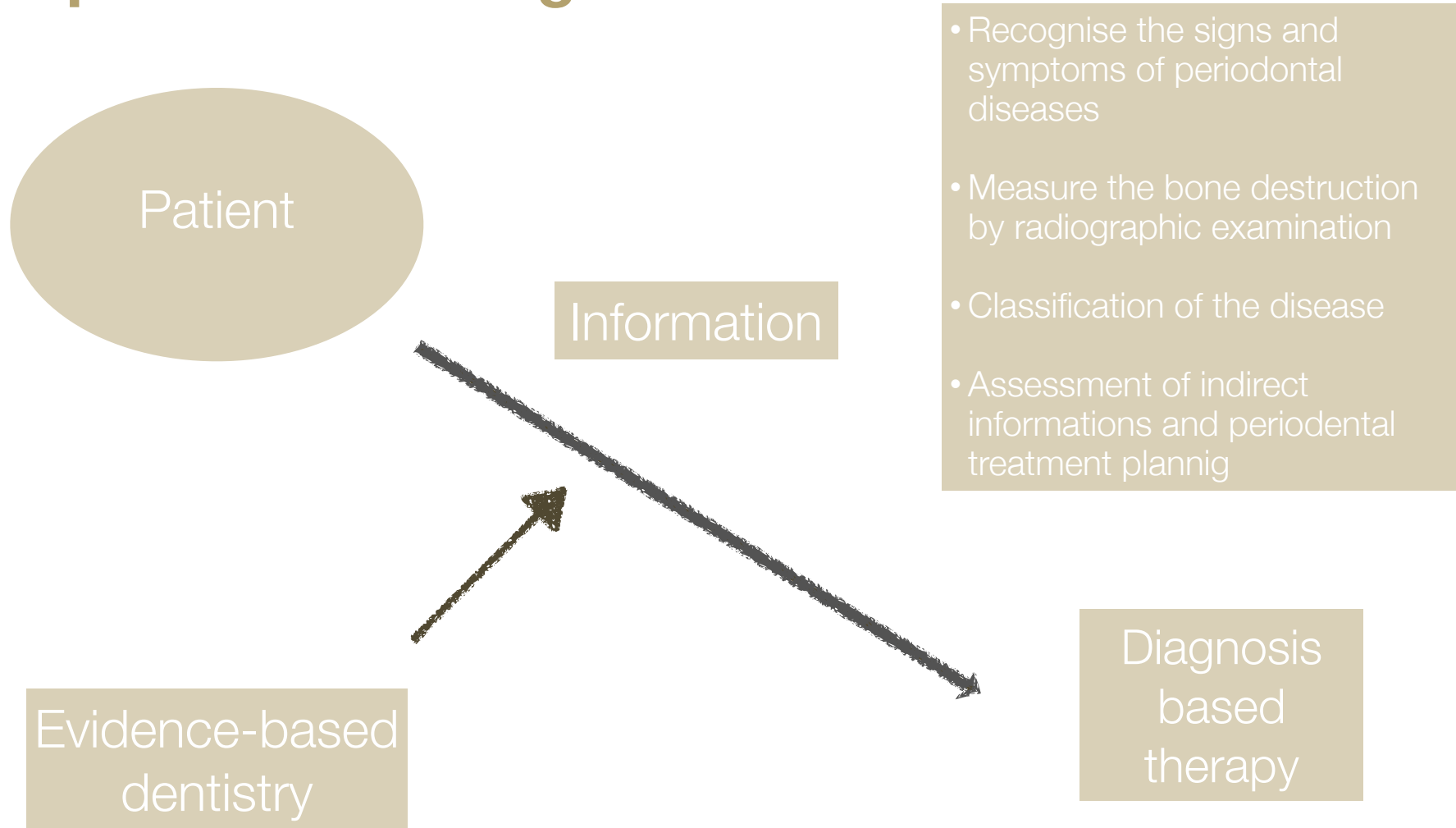
- primary goal of the clinical periodontal diagnosis:
  - to isolate the abnormal gingival-periodontal condition from the healthy periodontium
  - distinguish between reversible and irreversible processes
  - active/inactive process



# Steps of the full periodontal diagnosis

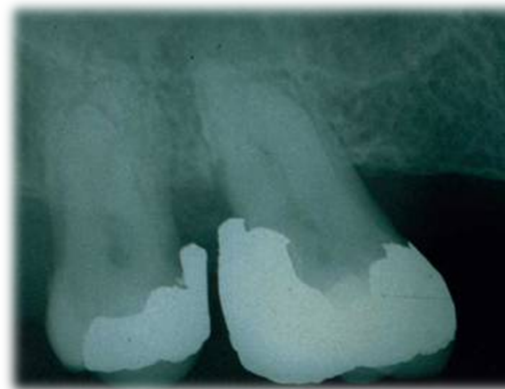
1. general and dental history - general medical aspects, systemic diseases, pregnancy, medication, AB prophylaxis requiring conditions, infectious diseases, smoking, dental history
2. general medical consultation - if necessary
3. clinical periodontal diagnosis - objective assessment of the oral hygiene, the actual extent of the inflammation and tissue destruction
4. special laboratory diagnosis - if necessary

# Goal of periodontal diagnostics



# Examination of the oral hygiene status

- plaque accumulation
- the deposits may be stained with a disclosing solution to facilitate their detection
- accumulation rate of the calculus
- the presence of retentive factors for plaque



# Examination of the oral hygiene habits



## Examination of the gingiva

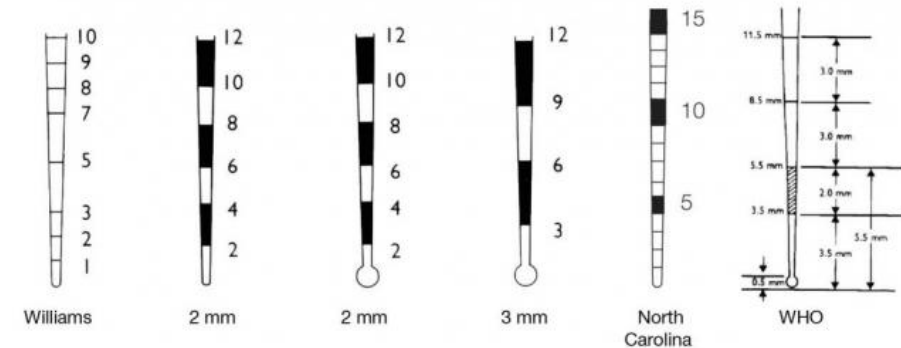
- changes in color
- shape
- texture
- bleeding on probing
- shape of the interdental papillae
- width of the keratinized gingiva
- mucogingival junction
- depth of the vestibule





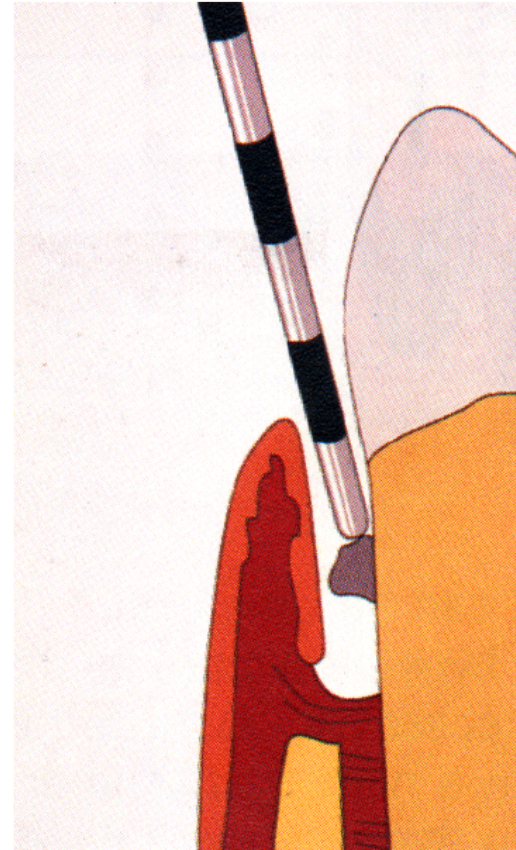
# Assessment of probing pocket depth

- calibrated periodontal probes - Williams, WHO, UNC-15
- distance from the gingival margin to the bottom of the gingival sulcus/ pocket
- parallel to the longitudinal axis of the tooth
- force of 0.20-0.25 Newton
- clinical probing depth

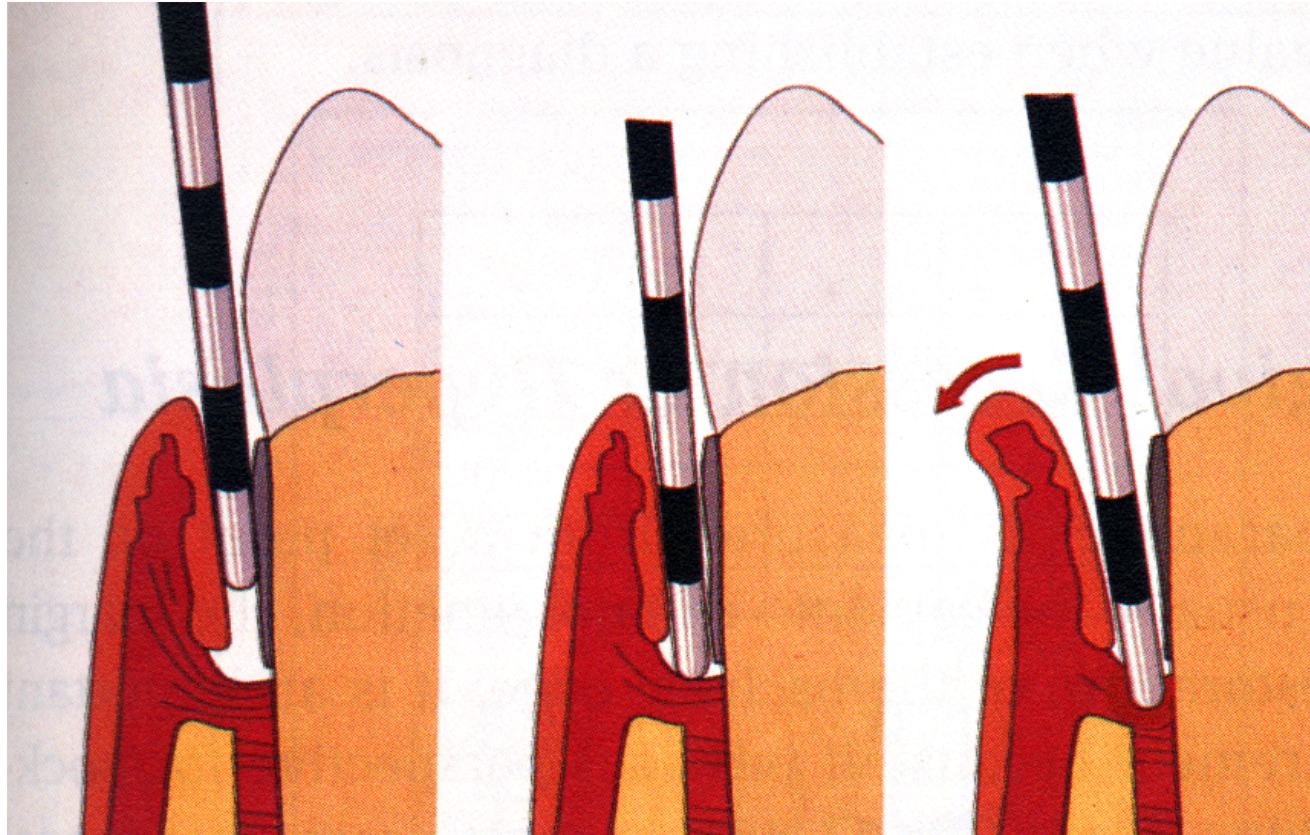


# Indirect diagnostic tools - appropriate assessment of pocket depth and clinical attachment level

Intermediate surrogate markers: indirect clinical signs of the extension of inflammation, or periodontal healing



# Indirect diagnostic tools - appropriate assessment of pocket depth and clinical attachment level

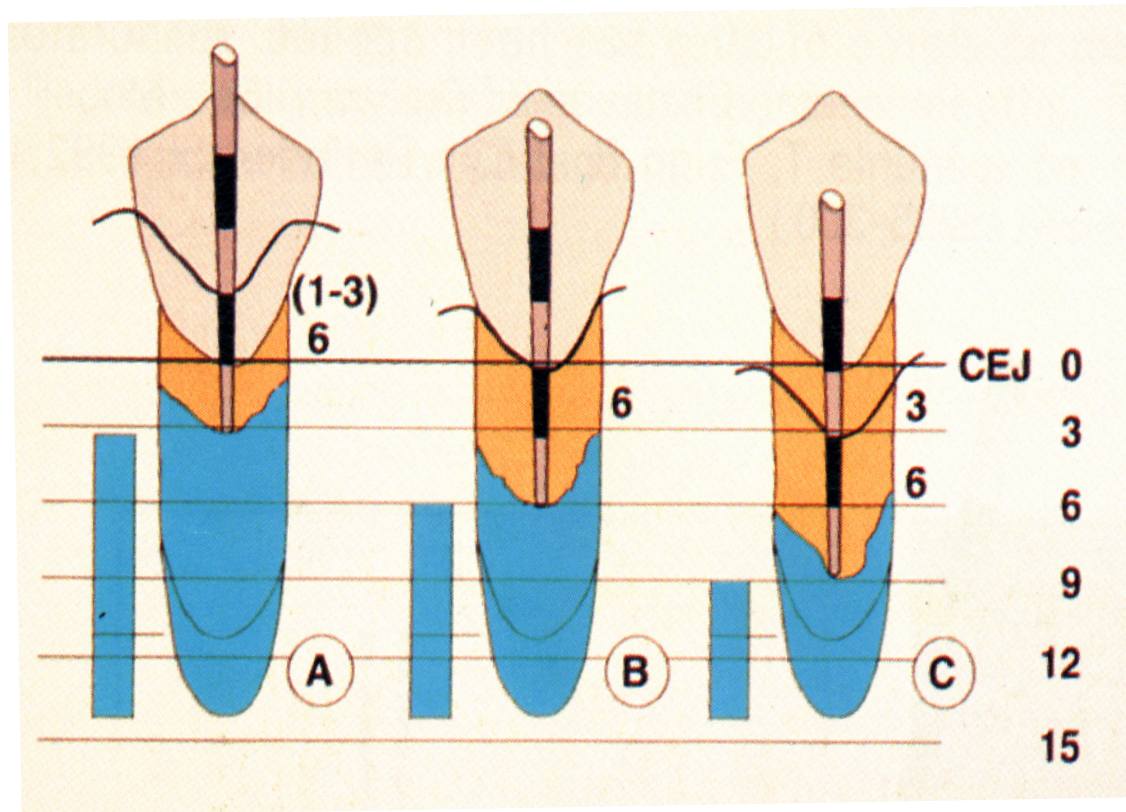


Challenges in diagnosis and classification of periodontal diseases and conditions  
Armitage GC. Zhonghua Kou Qiang Yi Xue Za Zhi. 2008 May;43(5):260-3.  
Manual periodontal probing in supportive periodontal treatment.  
Armitage GC. Periodontol 2000. 1996 Oct;12:33-9.  
Microscopic evaluation of clinical measurements of connective tissue attachment levels.  
Armitage GC, Svanberg GK, L e H. J Clin Periodontol. 1977 Aug;4(3):173-90

# Assessment of probing attachment level

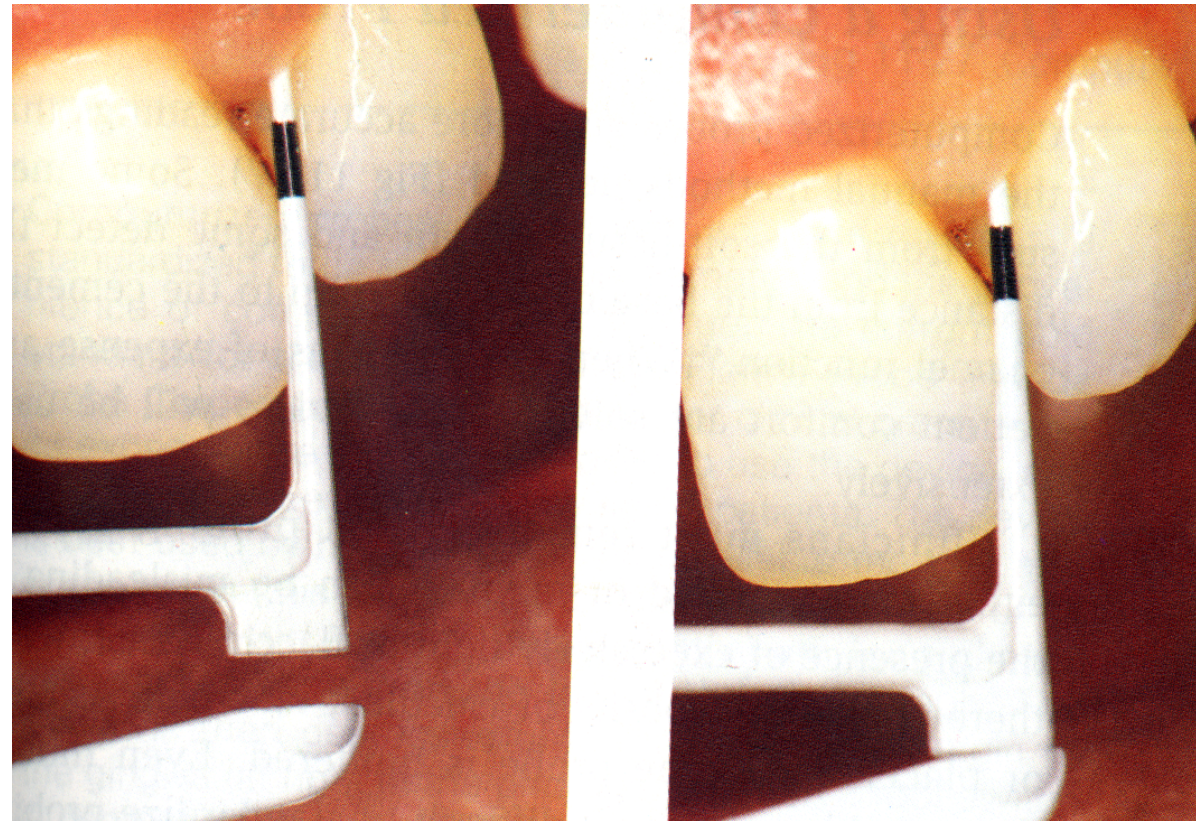
- the distance in mm from the cemento-enamel junction (CEJ) to the bottom of the probeable gingival/periodontal pocket - clinical attachment level (CAL) - probing attachment level (PAL)
- the difference between the actual probing depth and CAL is the gingival recession (GR)
- influencing factors: thickness of the used probe, force, angulation and positioning of the used probe, the applied pressure, the degree of the inflammation

# Indirect diagnostic tools - appropriate assessment of pocket depth and clinical attachment level



$$CAL = PPD + GR$$

# Indirect diagnostic tools - appropriate assessment of pocket depth and clinical attachment level



# BPE - Basic Periodontal Examination

## How to record the BPE?

1. The dentition is divided into 6 sextants:
  - upper right (17 to 14), upper anterior (13 to 23), upper left (24 to 27)
  - lower right (47 to 44), lower anterior (43 to 33), lower left (34 to 37)
2. All teeth in each sextant are examined (with the exception of 3rd molars).
3. For a sextant to qualify for recording, it must contain at least 2 teeth. (If only 1 tooth is present in a sextant, the score for that tooth is included in the recording for the adjoining sextant).
4. A WHO BPE probe is used (World Health Organisation probe). This has a “ball end” 0.5 mm in diameter, and a black band from 3.5 to 5.5 mm. Light probing force should be used (20-25 grams).

[http://www.bsperio.org.uk/publications/downloads/39\\_143748\\_bpe2011.pdf](http://www.bsperio.org.uk/publications/downloads/39_143748_bpe2011.pdf) -

# BPE - Basic Periodontal Examination

## Scoring codes

- 0** - No pockets >3.5 mm, no calculus/overhangs, no bleeding after probing (black band completely visible)
- 1** - No pockets >3.5 mm, no calculus/overhangs, but bleeding after probing (black band completely visible)
- 2** - No pockets >3.5 mm, but supra- or subgingival calculus/overhangs (black band completely visible)
- 3** - Probing depth 3.5-5.5 mm (black band partially visible, indicating pocket of 4-5 mm)
- 4** - Probing depth >5.5 mm (black band entirely within the pocket, indicating pocket of 6 mm or more)
- \* - Furcation involvement

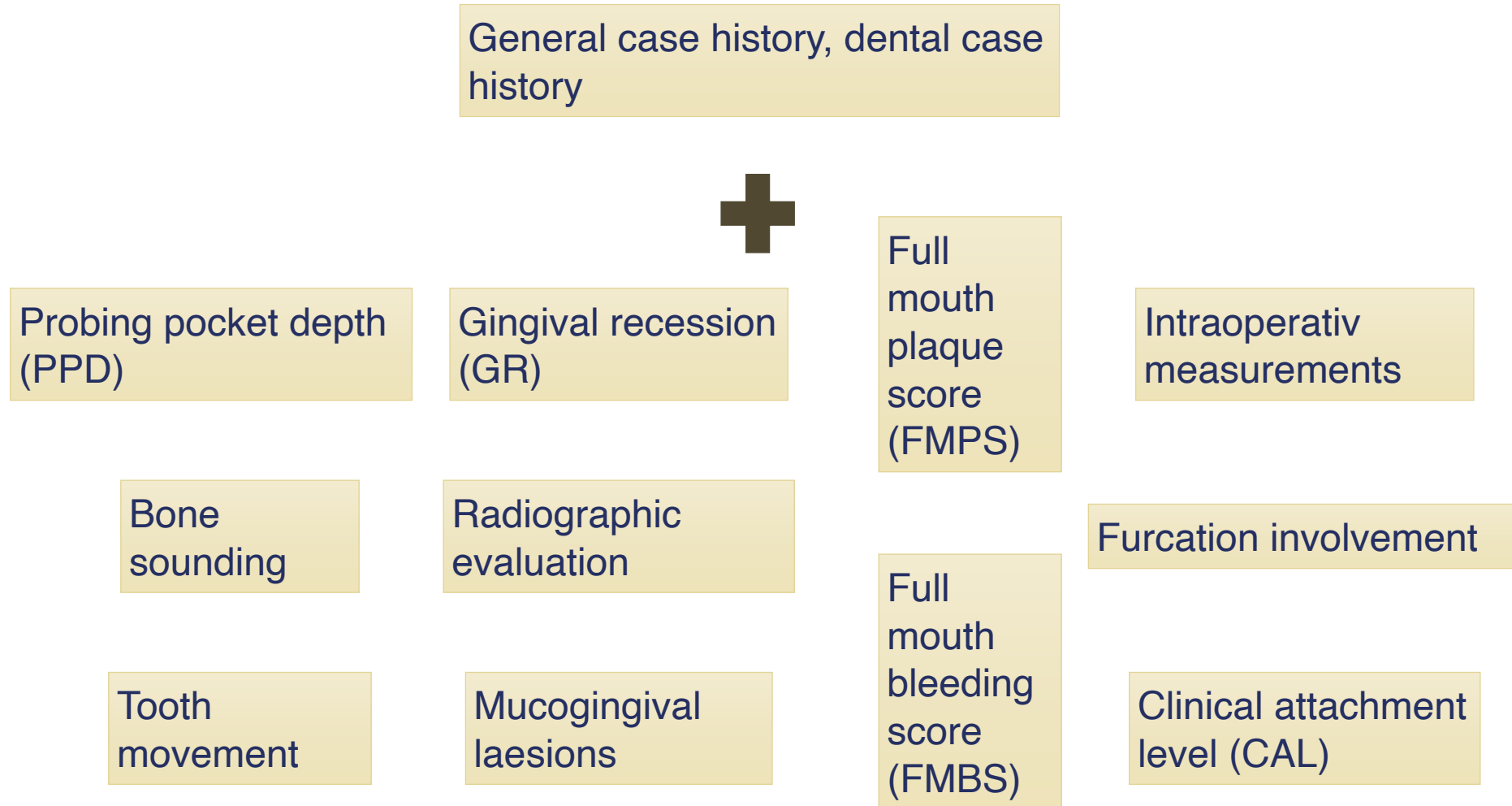


# BPE - Basic Periodontal Examination

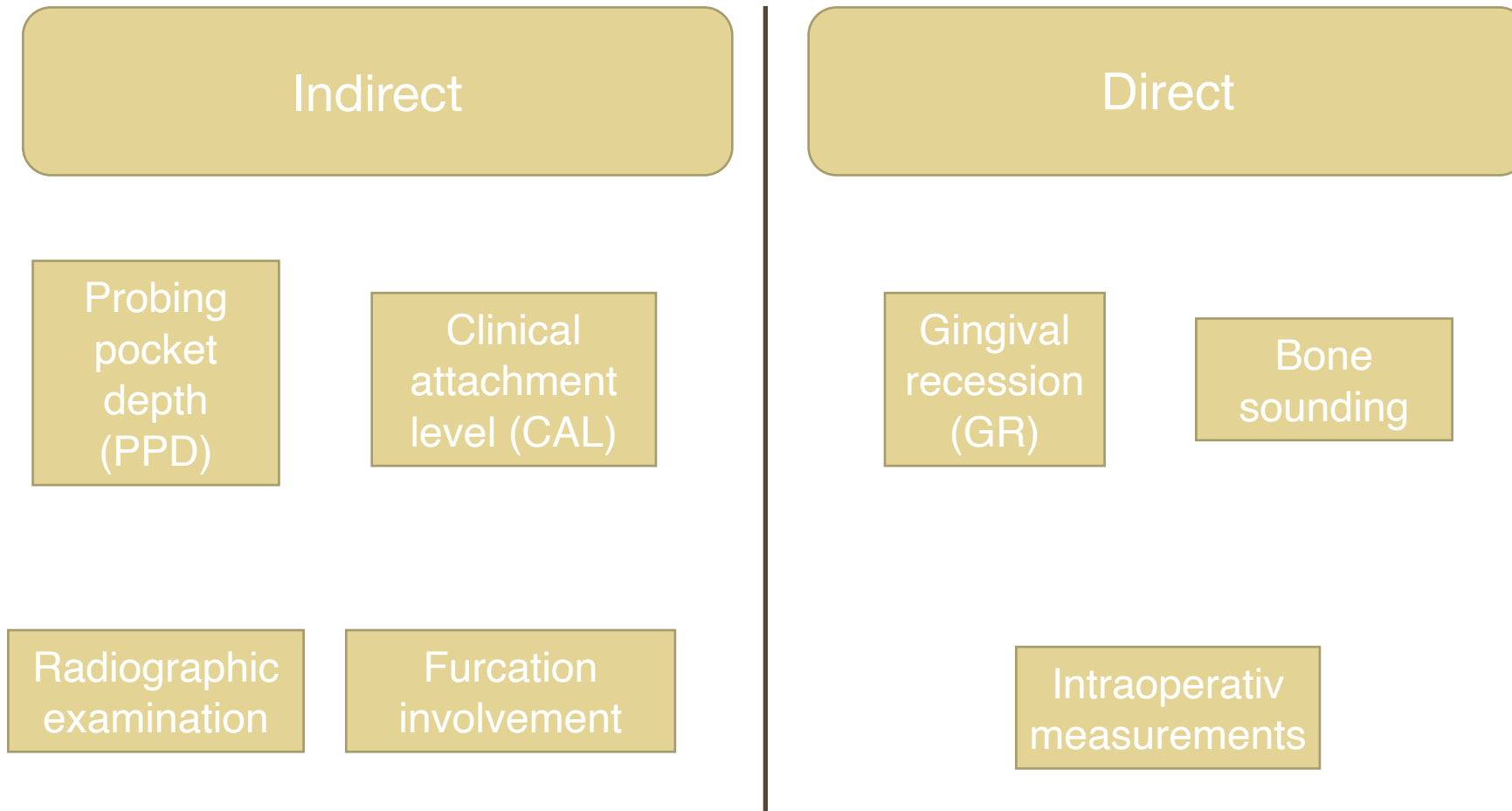
0	No need for periodontal treatment
1	Oral hygiene instruction (OHI)
2	OHI, removal of plaque retentive factors, including all supra- and subgingival calculus
3	OHI, root surface debridement (RSD)
4	OHI, RSD. Assess the need for more complex treatment; referral to a specialist may be indicated.
*	OHI, RSD. Assess the need for more complex treatment; referral to a specialist may be indicated.

- As a general rule, radiographs to assess alveolar bone levels should be obtained for teeth or sextants where BPE codes 3 or 4 are found.

# Information



# Diagnostic Tools

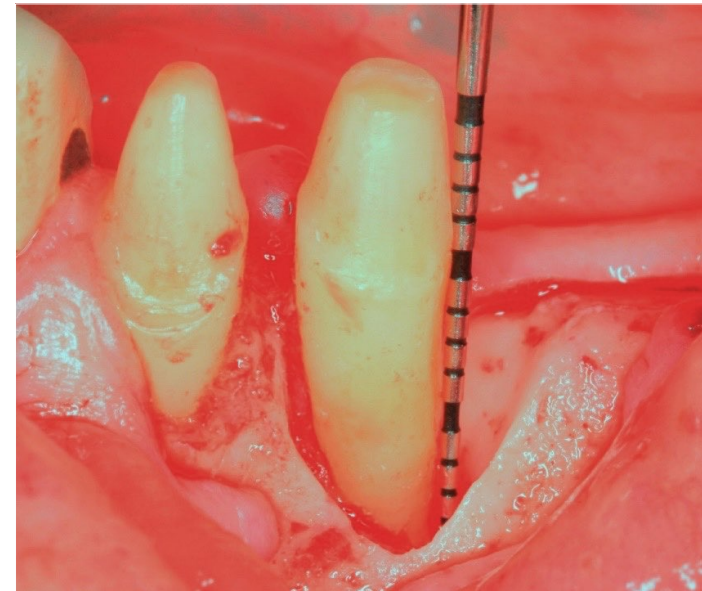


# Diagnostic Tools

Indirect



Direct



# Gingival recession

## - direct diagnostic parameter - classification after Miller

- distance between cemento-enamel junction and gingival margin

### **Class I:**

- marginal tissue recession not extending to the mucogingival junction
- no loss of interdental bone or soft tissue

### **Class II:**

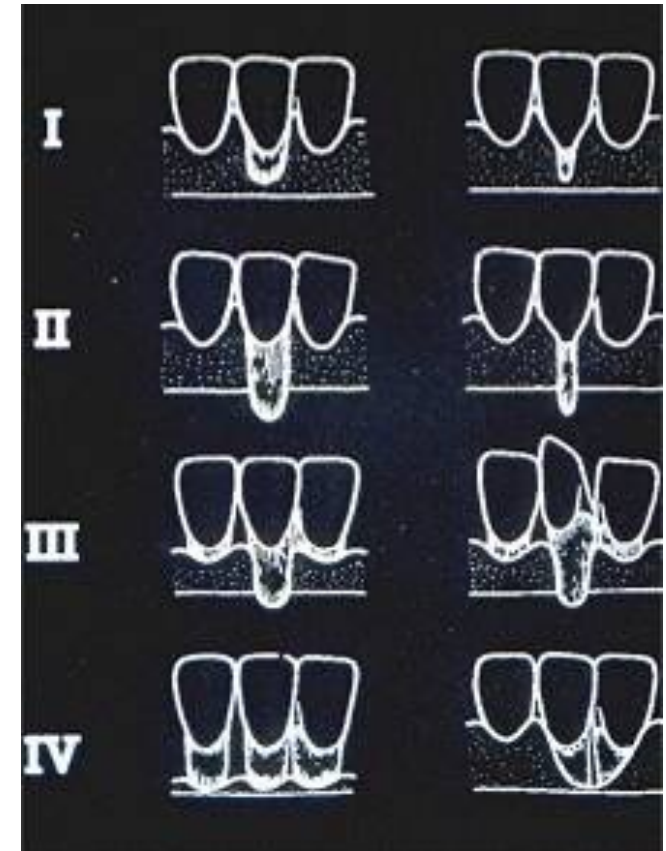
- marginal tissue recession extends to or beyond the mucogingival junction
- no loss of interdental bone or soft tissue

### **Class III:**

- marginal tissue recession extends to or beyond the mucogingival junction
- loss of interdental bone (III.a )
- loss of interdental bone and soft tissue (III.b)
- or malposition of the tooth

### **Class IV:**

- marginal tissue recession extends beyond the mucogingival junction
- severe bone loss and soft tissue loss interdentally
- and/or severe tooth malposition



Miller PD: „A classification of marginal tissue recession“. 1985, 9-14, Int J Periodontics Restorative Dent.

# Gingival recession - direct diagnostic parameter

- **GRD**: gingival recession depth
- **GRW**: width of the gingiva recession
- **AGW**: width of the attached gingiva
- **PCD**: papilla contact point distance
- **PW**: papilla width
- **PD**: pocket depth



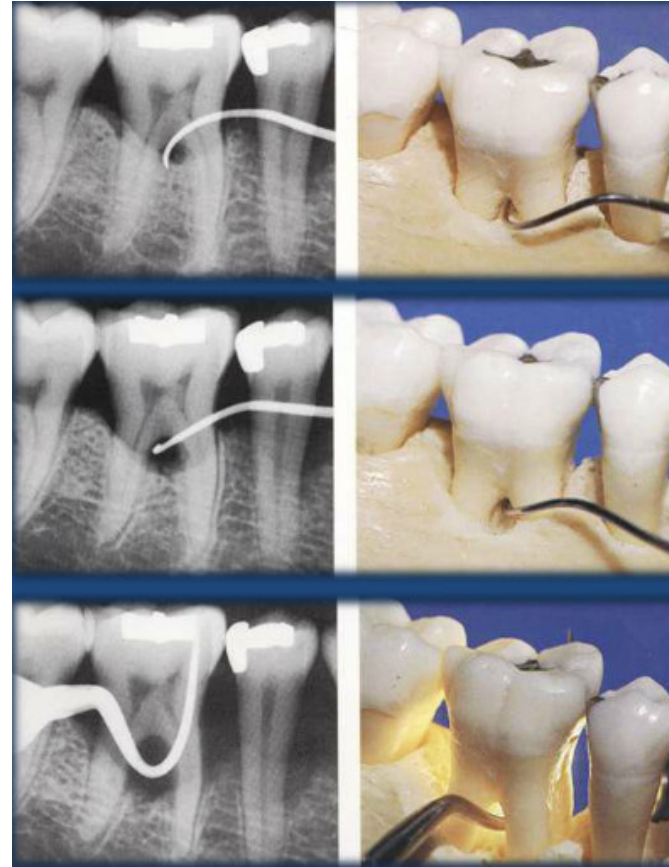
	44	43	42	41	31	32	33	34	
<b>GRM</b>									<b>GRM</b>
<b>GRSZ</b>									<b>GRSZ</b>
<b>KGSZ</b>									<b>KGSZ</b>
<b>PKD</b>									<b>PKD</b>
<b>PSZ</b>									<b>PSZ</b>
<b>PD</b>									<b>PD</b>

BUCCAL

# Assessment of furcation involvement

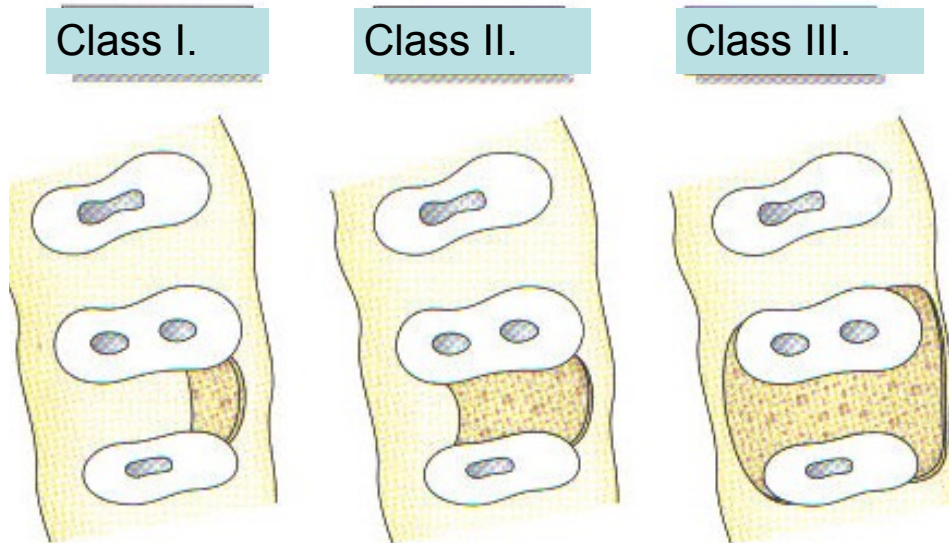
- in the progression of periodontitis around multirrooted-teeth, the destructive process may involve the supporting structures of the furcation area
- Nabers furcation probe - curved, graduated at 3mm
- depending on the penetration depth:
- **I. class** - horizontal probing depth less than 3 mm from one or two entrances
- **II. class** - horizontal probing depth is more than 3 mm from one entrance
- **III. class** - horizontal probing depth is more than 3 mm from in two or more entrances, “through-and-through” involvement

# Assessment of furcation involvement





# Assessment of furcation involvement



Class I- initial, furcation involvement, vertical bone loss

Class II – incomplete furcation defect, horizontal and vertical bone loss

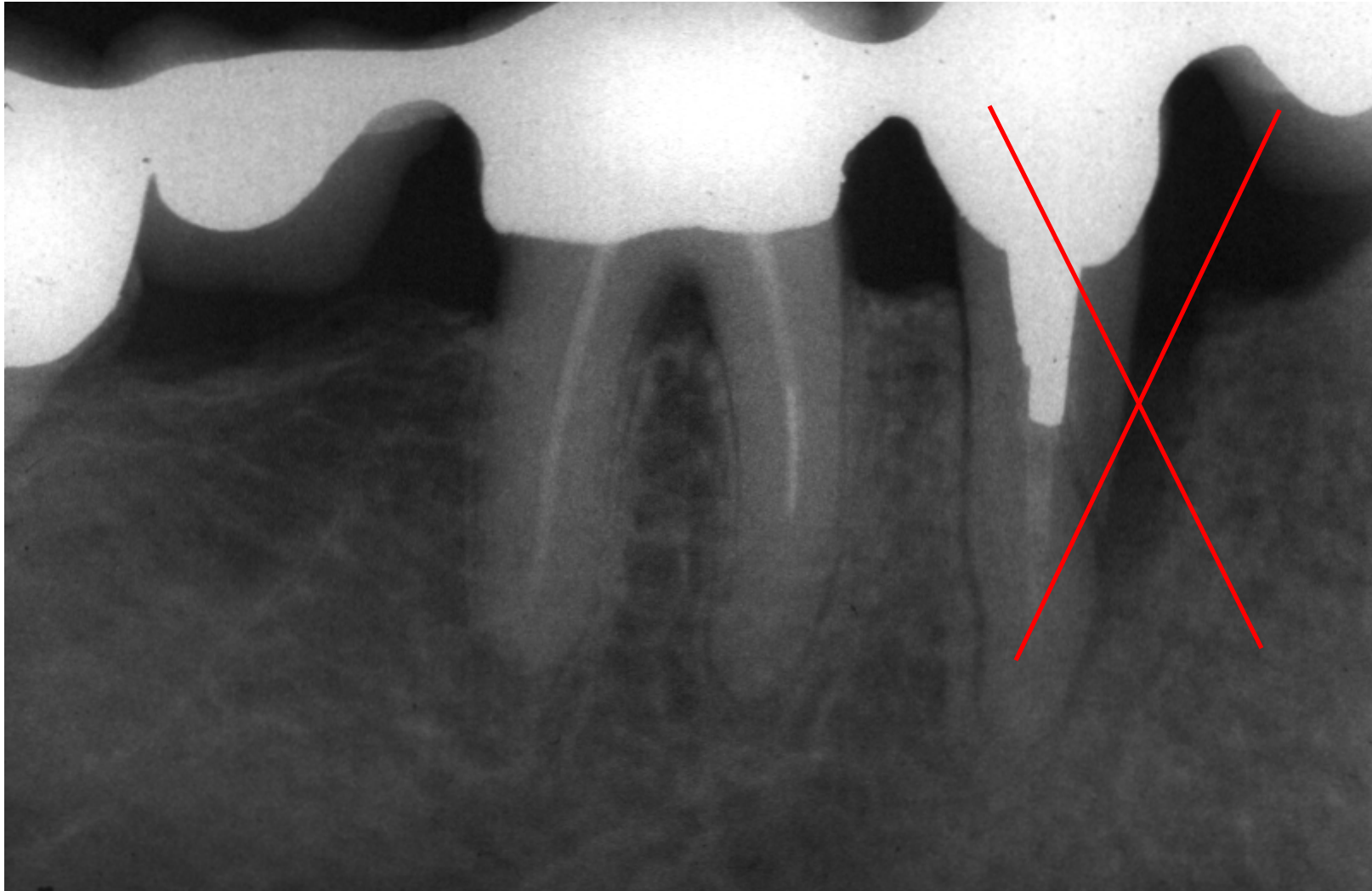
Class III – complete penetration



# Assessment of tooth mobility

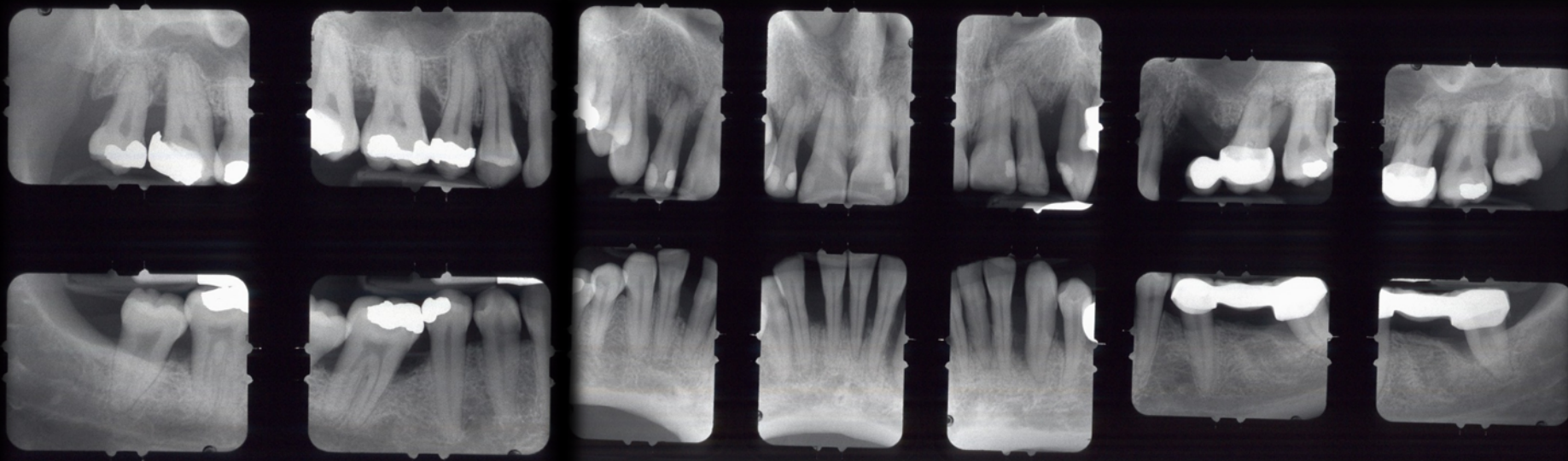
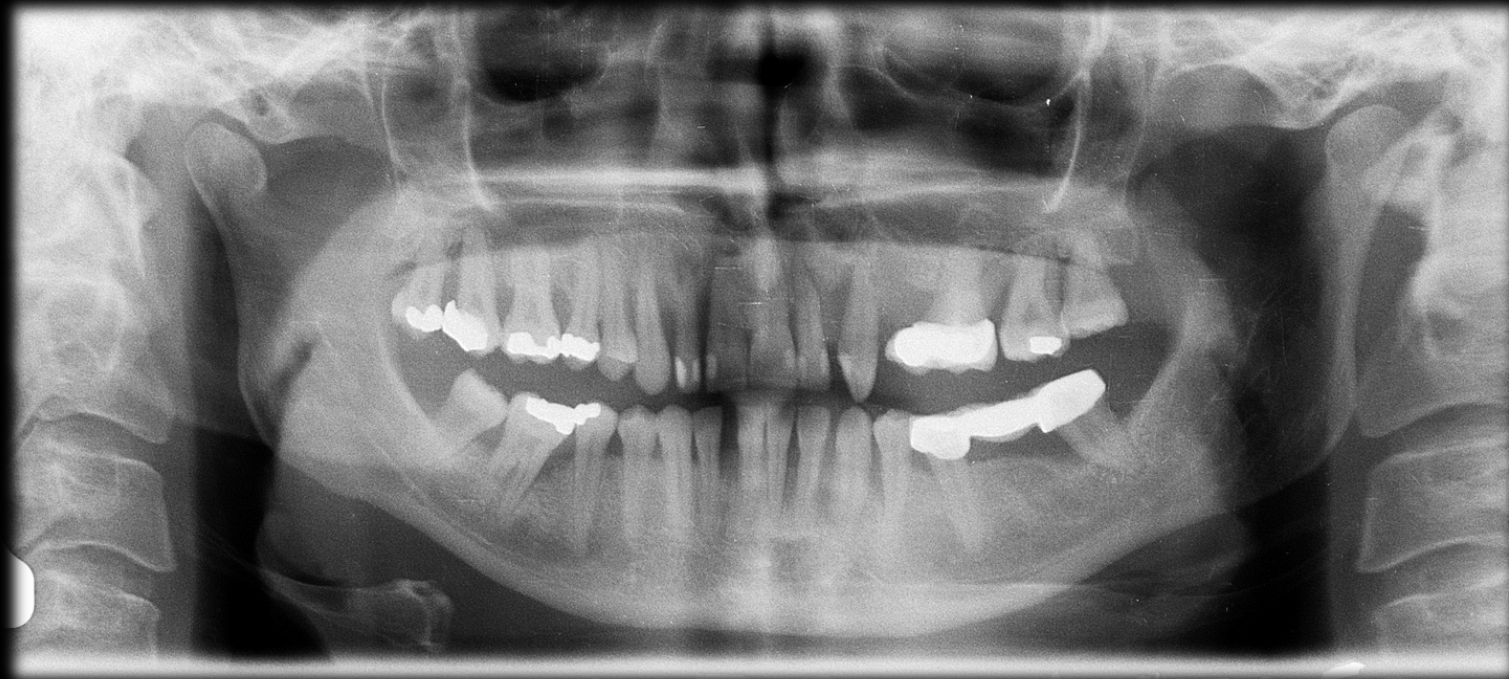
- the continuous loss of the supporting tissue during periodontal disease progression may result in increased tooth mobility
- **degree 0**: “physiological” mobility measured at the crown level, the tooth is mobile in a horizontal direction to 0.1-0.2 mm
- **degree 1**: increased mobility of the crown of the tooth to at the most 1mm in a horizontal direction
- **degree 2**: visually increased mobility of the crown of the tooth exceeding 1mm in a horizontal direction
- **degree 3**: severe mobility, exceeding 1mm in a horizontal direction
- trauma from occlusion!!! - widened periodontal ligament, overloading of the teeth

# Radiology - objective diagnostical parameter



# Radiographic examination

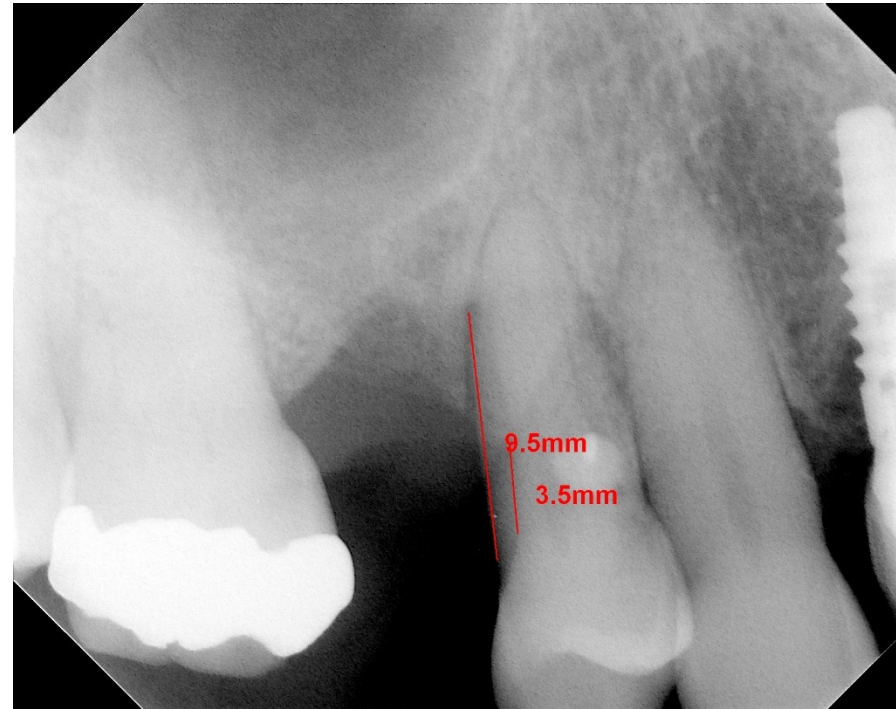
- panorama x-ray is just informative
- the height of the alveolar bone and the outline of the bony crest are examined in radiographs
- a long-cone paralleling technique is recommended
- reproducibility! - silicone templates



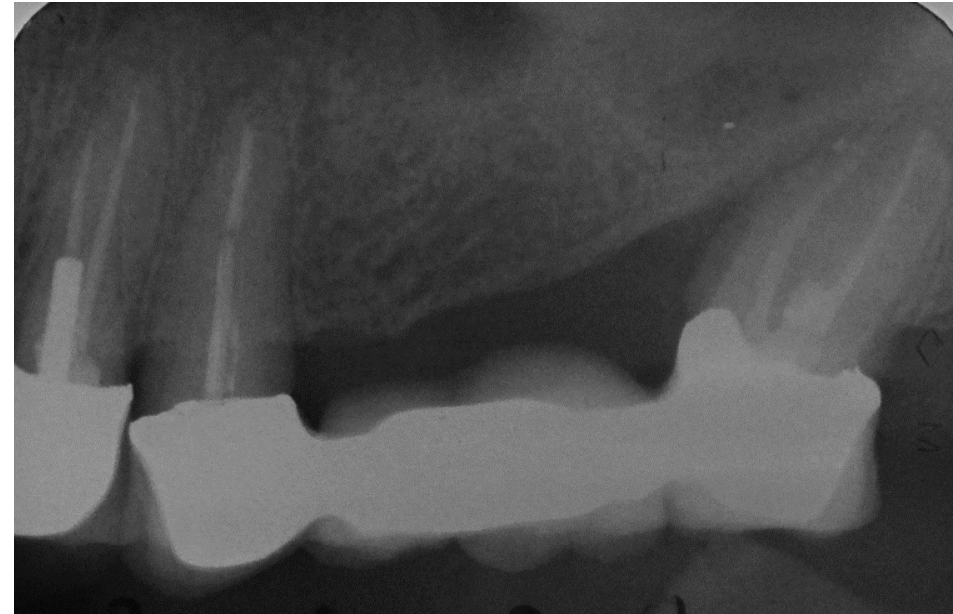
# Relevant formulas from the perspectives of the periodontal disease

- tooth crown- CEJ, the presence of plaque retentive factors, the presence of calculus
- limbus alveolaris - the presence of the lamina dura
- interdental/interradicular bone - density, structure
- roots of the tooth - number, shape, divergence, furcation involvement
- periodontal gap - presence, width, form

# Interdental bone level, trabecular bone structure

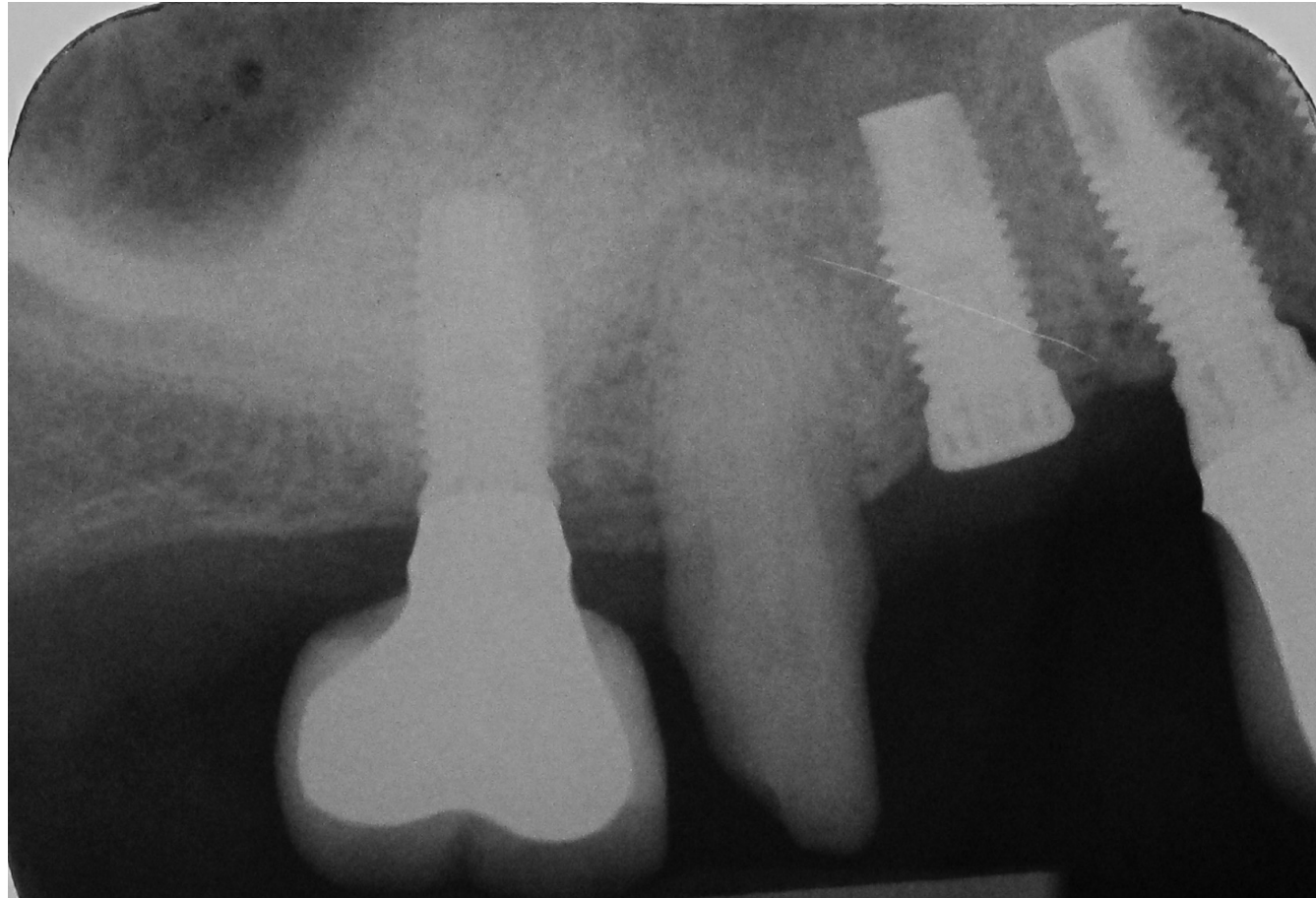


# Lamina dura and furcation involvement



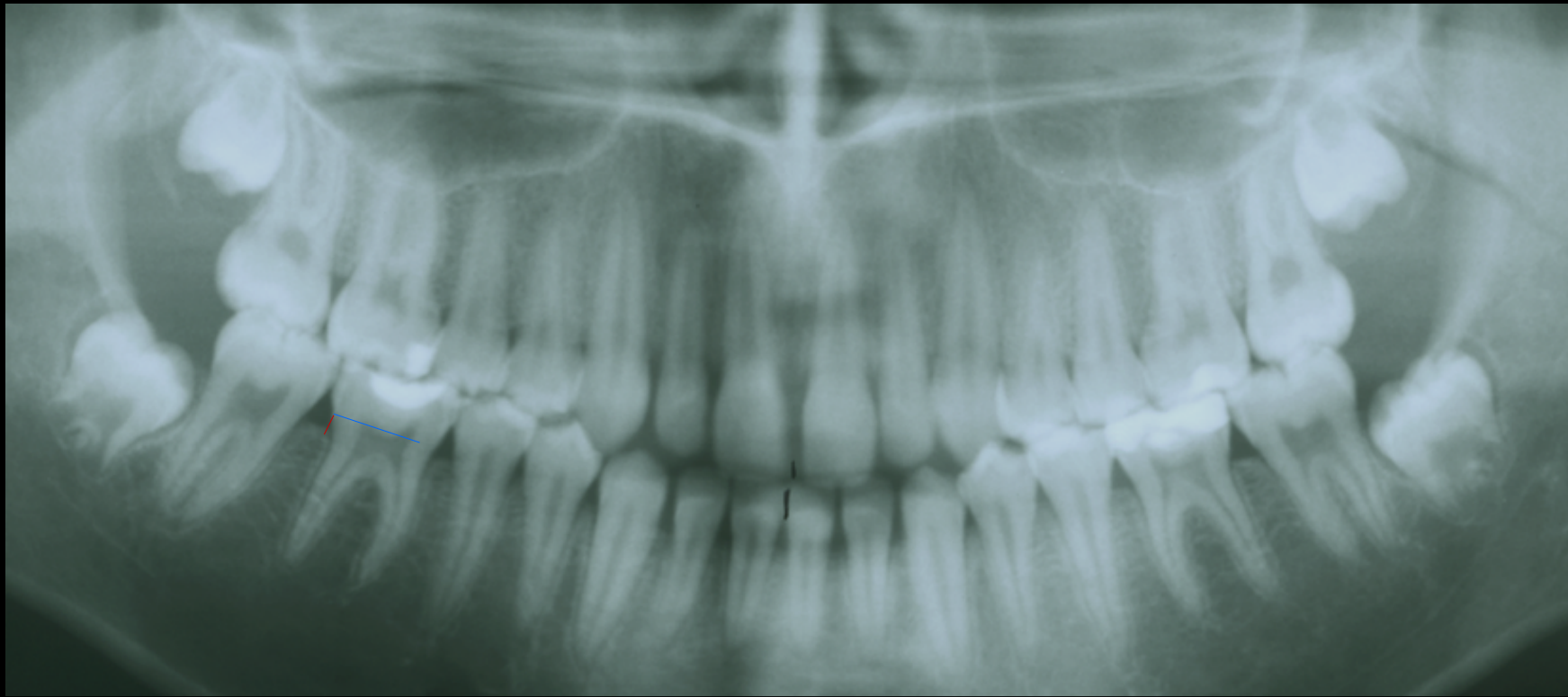


# Root length and shape, width of the periodontal gap



# Radiographic characteristics of the healthy periodontium

- limbus alveolaris clearly distancing itself
- lamina dura is located 1-2mm apically from the CEJ
- in slimmer interdental spaces the shape of the limbus alveolaris has a sharpening edge
- in wider interdental spaces it will be rounded

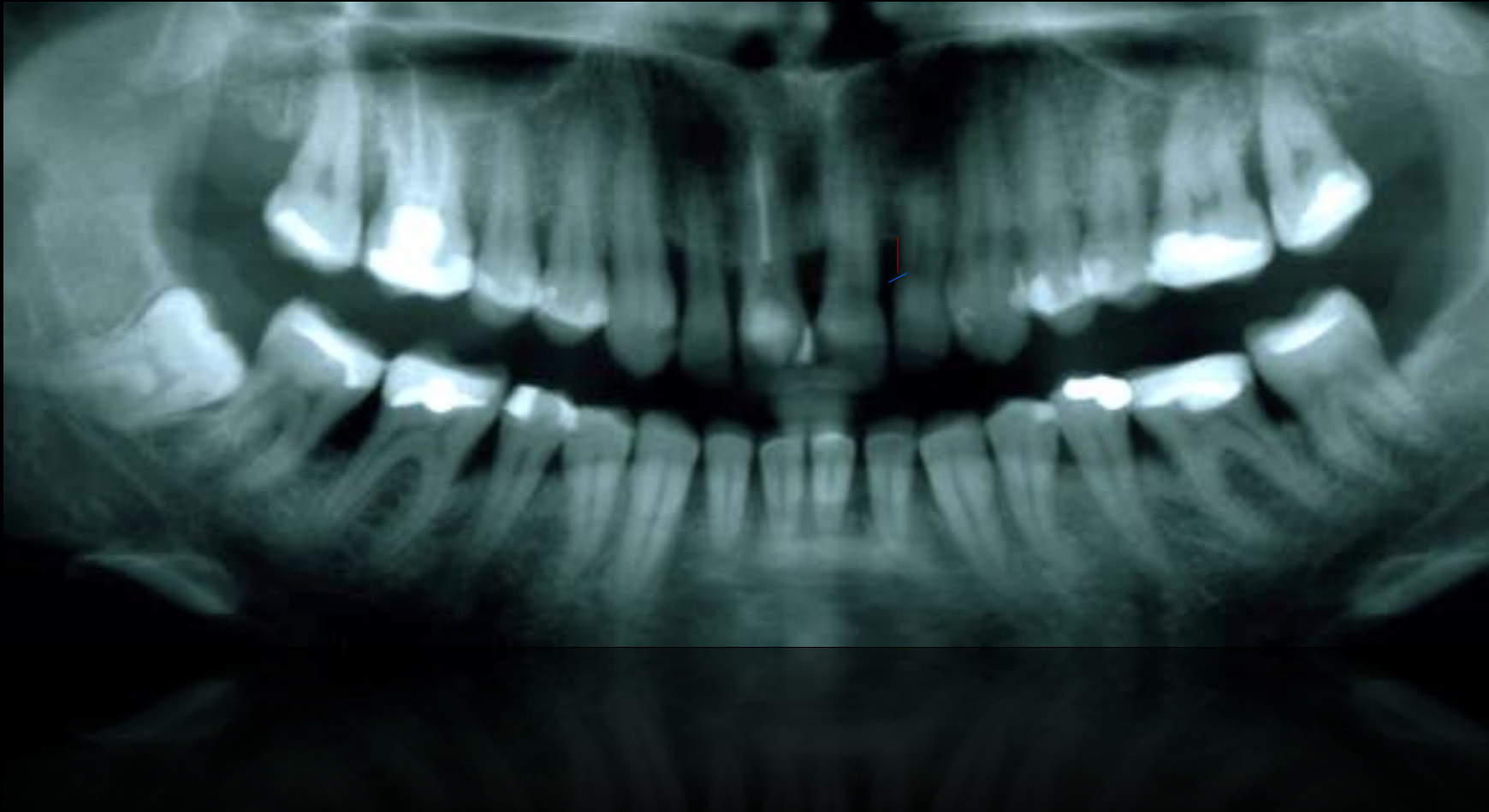


# Radiographic characteristics of gingivitis

- is similar to healthy periodontium
- interdental septum shows lower density

# Radiographic characteristics of periodontitis

- limbus alveolaris is parallel with the occlusal plane
- more than 2mm from the CEJ apically
- the line of the lamina densa is barely visible or not visible

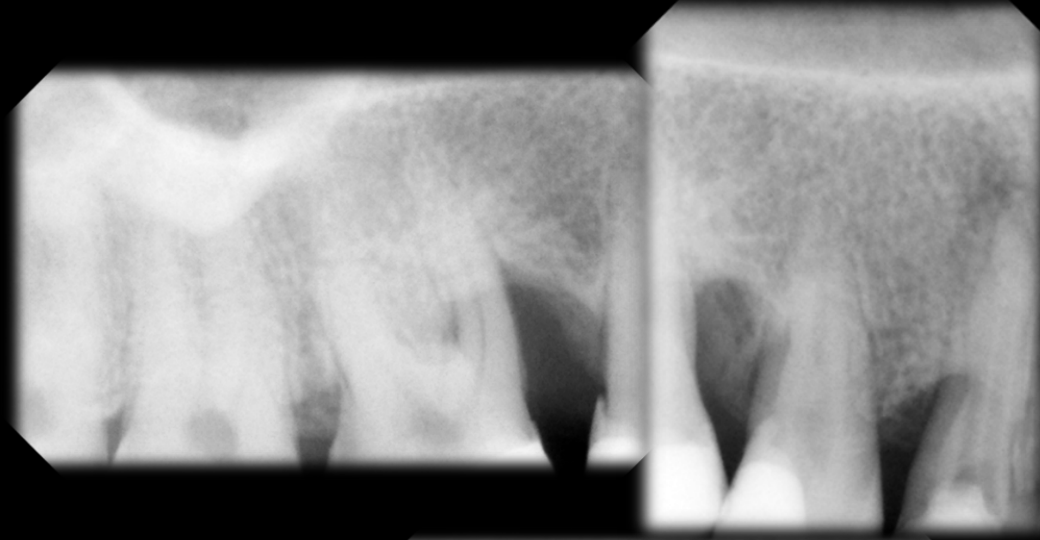




# Radiographic characteristics of the repaired periodontitis

- the same as the picture of periodontitis
- but the line of the lamina densa is clearly visible





before treatment



after 1 year



after 7 years



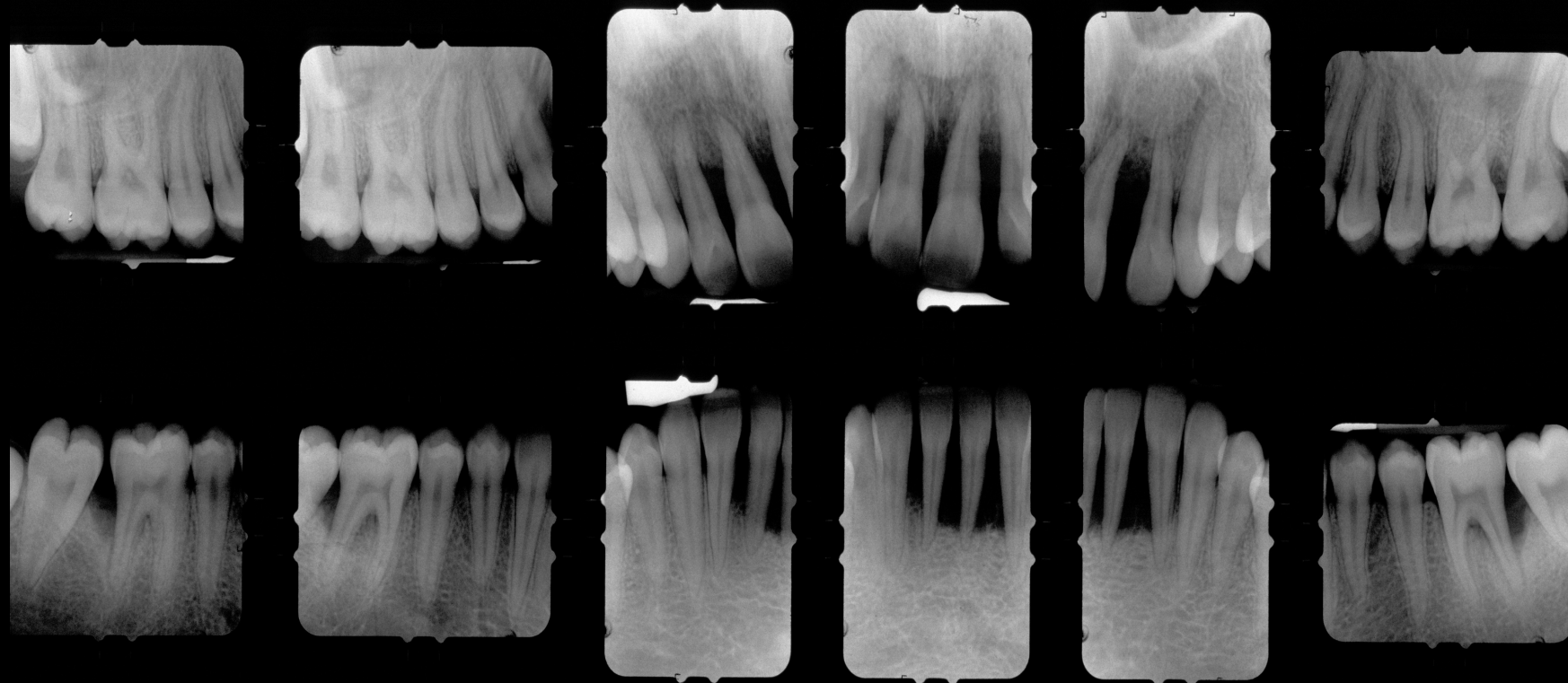
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# Radiographic characteristics of the aggressive periodontitis

- limbus alveolaris is not parallel with the occlusal plane
- more than 2mm from the CEJ apically
- the line of the lamina densa is not visible
- horizonto-vertical bone loss
- building of proximal defects
- circumferential defects around the teeth





# CBCT vs. Intraoral X-ray

CBCT



Intraoral x-ray

- CBCT images allowed comparable measurements of periodontal bone levels and defects as intraoral radiography.
- CBCT images demonstrated more potential in the morphological description of periodontal bone defects, while the digital radiography provided more bone details.
- These findings may offer perspectives for further studies on periodontal diagnostics, prognostics, and presurgical planning with CBCT.

Mengel R, Candir M, Shiratori K, Flores-de-Jacoby L.

Digital volume tomography in the diagnosis of periodontal defects: an in vitro study on native pig and human mandibles. J Periodontol. 2005 May;76(5):665-73.

# Additional possibilities for examination

- bacteriological tests - bacterial DNA analysis
- immunological tests
- microbial enzymatic reactions
- laboratory evaluation of the predisposing factors
- PMN-leukocyte function analysis
- monocyte reactivity analysis
- genetic tests

# Determination of the periodontal prognosis of the teeth

- excellent prognosis
- good prognosis - moderate attachment loss
- acceptable prognosis
- in question prognosis
- bad prognosis
- hopeless prognosis

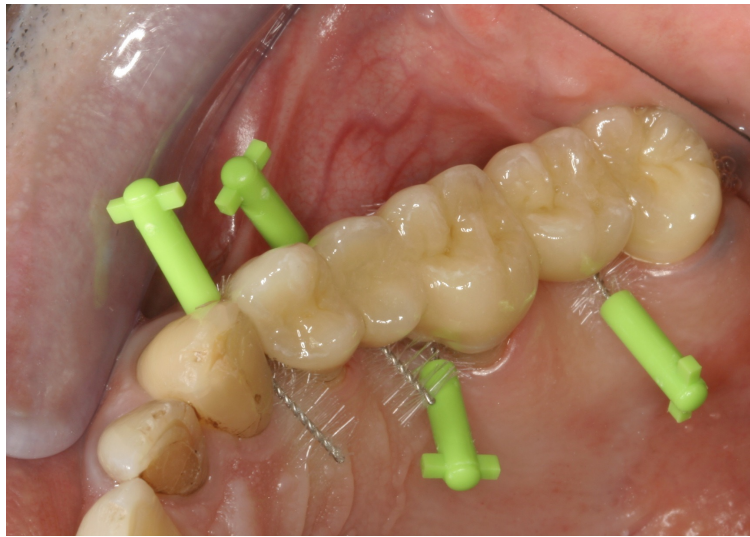
# Defining prognostic factors

- general factors:
- age
- the severity of the disease
- the clinical form of periodontitis - any form of the aggressive periodontitis is not good
- the individual plaque-control, cooperation
- smoking
- genetic and systemic factors



# Defining prognostic factors

- local factors:
- presence of plaque and calculus
- tooth mobility
- furcation involvement
- prosthetic viewpoint - to keep periodontally compromised teeth? extraction and implantation?





# Summary

- **Indirect** methods are reliable indicators of healing but cannot be used to measure bony filling.
- **Direct** parameters reliably measure bony filling but are invasive therefore can only be used with the patient informed consent in special cases
- The significance of digitalized radiographic methods in the treatment planning increases, but with their current progress marginal bone level can be judged more precisely with conventional radiological methods.

# Thank you for your attention!

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