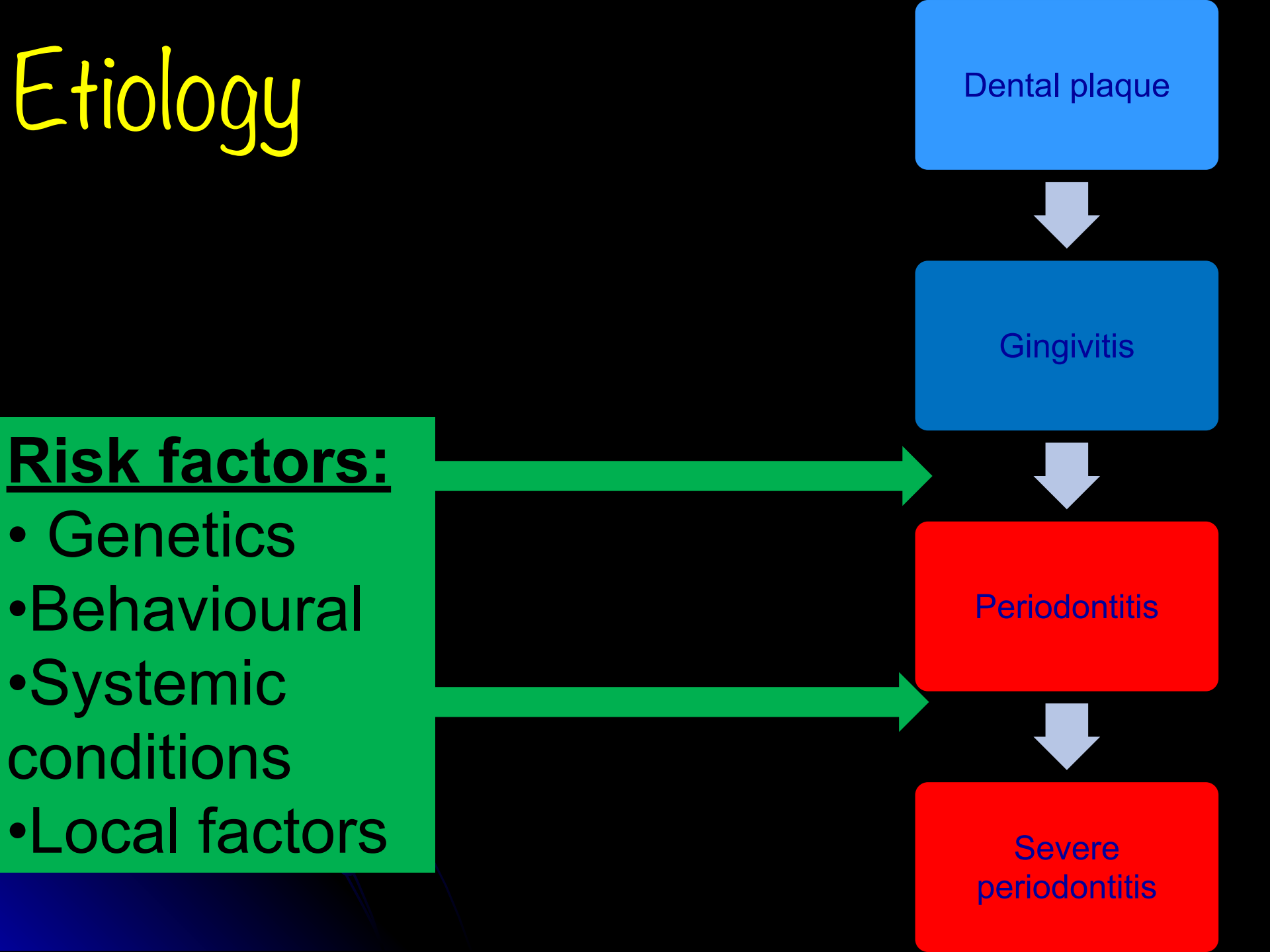
START !

LOCAL PLAQUE RETENTIVE FACTORS

Pal Nagy DMD
Department of Periodontology

LOCAL PLAQUE RETENTIVE FACTORS

Etiology


Dental plaque
Gingivitis
Periodontitis
Severe periodontitis
Risk factors:
• Genetics
•Behavioural
•Systemic conditions
•Local factors

Risk factors of periodontitis

Local

- Anatomical
- Tooth position and diseases
- Iatrogenic !!!

THE PRIMARY FACTOR IN THE ETIOLOGY OF PERIODONTAL DISEASES IS THE ACCUMULATION AND MATURATION OF A BACTERIAL PLAQUE ON THE TEETH NEAR THE GINGIVAL MARGIN OR/AND IN THE SULCUS OR POCKET

HOWEVER, PLAQUE ACCUMULATION IS INFLUENCED BY NUMEROUS LOCAL ANATOMICAL AND IATROGENIC FACTORS

Etiological factors which modifies plaque accumulation

Anatomical factors

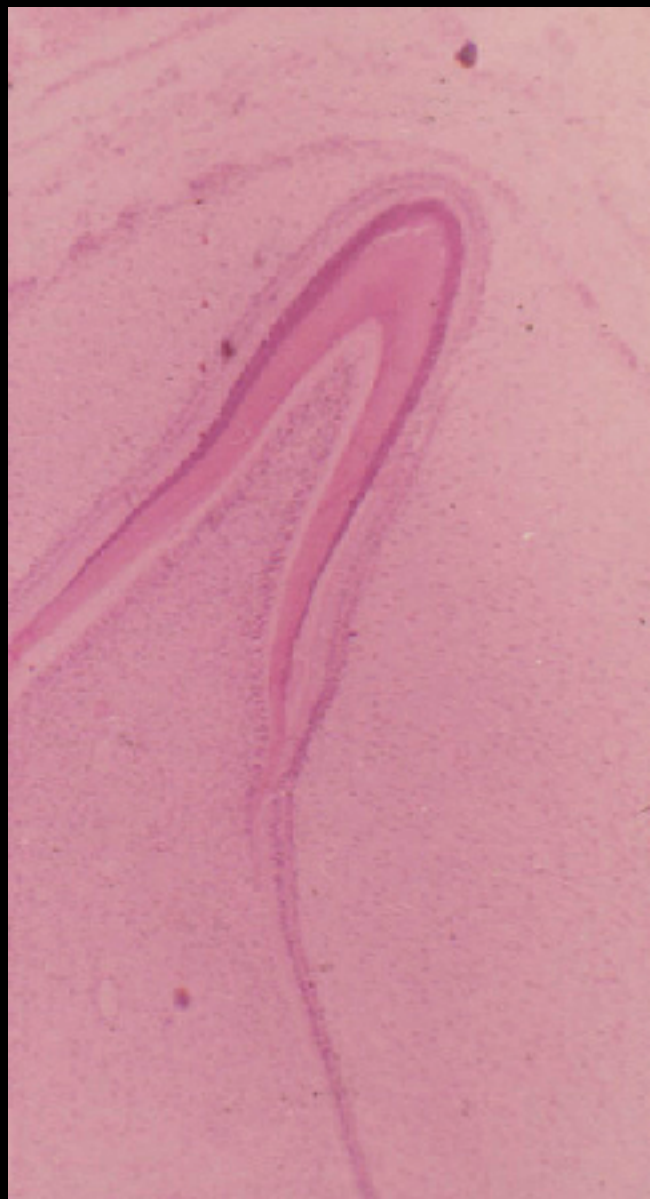
Dental positional anomalies and pathological lesions

Iatrogenic factors

ETIOLOGIC FACTORS FOR THE DEVELOPMENT OF DENTAL PLAQUE

I. ANATOMICAL FACTORS

- PALATAL SULCUS OF UPPER INCISORS
- FURCATION AREAS
- ENAMEL PROJECTIONS AND PEARLS
- GINGIVAL RECESSION
- FRENULUMS



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STARTS FROM THE PALATAL TUBERCLE, BECOMES A FOCUS FOR PLAQUE ACCUMULATION AND ENHANCES POCKET FORMATION

Lee KW, Lee EC, Poon KY. Palato-gingival grooves in maxillary incisors. A possible predisposing factor to localised periodontal disease. Br Dent J. 1968 Jan 2;124(1):14-8.

I. ANATOMICAL FACTORS

- PALATAL SULCUS OF UPPER INCISORS
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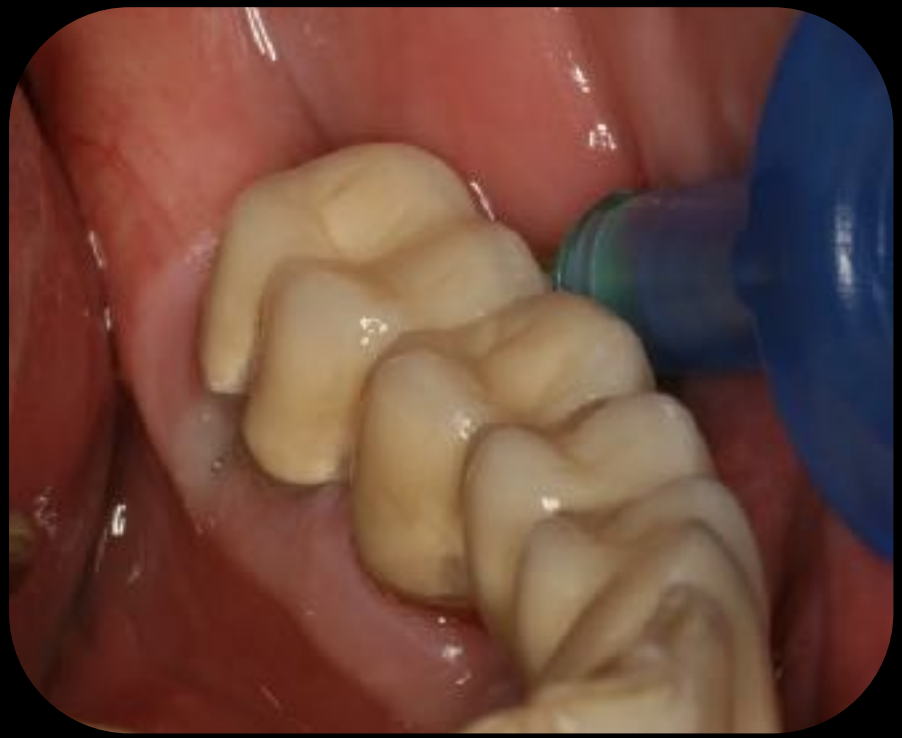
Furcation region

- Hardly reach for subgingival scaling, root planing and plaque control

Closed furcation

Open furcation
(plaqueretention)



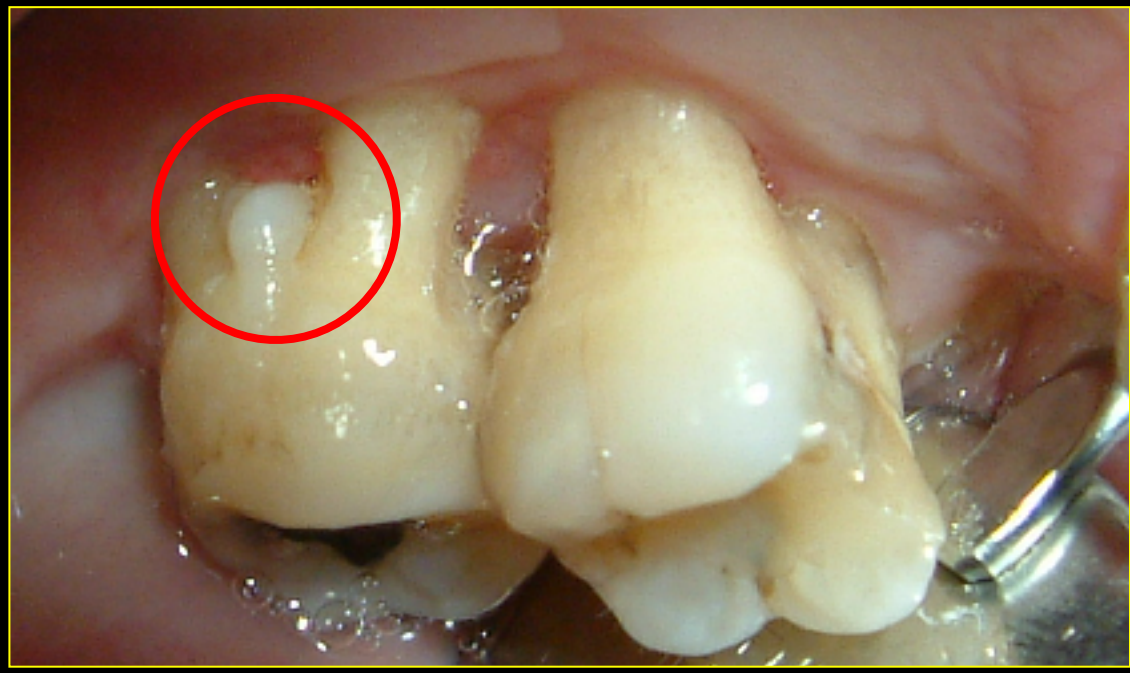
CLASS III. FURCATION LAESION, TUNNEL BETWEEN THE MESIAL AND DISTAL ROOTS

LOWER MOLAR TOOTH AFTER THE DISSECTION AND RESECTION OF THE DISTAL ROOT

PSEUDOFURCATION ON THE ROOTS OF CENTRAL INCISIORS

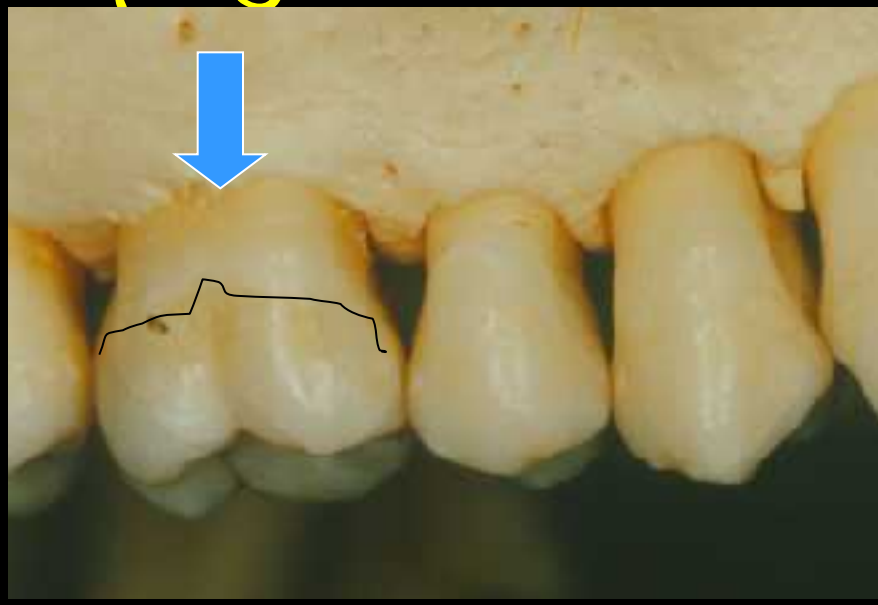
I. ANATOMICAL FACTORS

- PALATAL SULCUS OF UPPER INCISORS
- FURCATION AREAS
- ENAMEL PROJECTIONS AND PEARLS
- GINGIVAL RECESSION
- FRENULUMS



Cervical enamel projections

- No connective tissue attachement
- Furcation laesion can evolve



Cervical enamel projections

- The frequency of furcation laesion was up to 82.5% next to enamel projections
- Furcation laesion on control tooth is only 17.5%

Hou G-L, Tsai C-C. Relationship between periodontal furcation involvement and molar cervical enamel projections. *J Periodontol* 1987: **58**: 715–721

Enamel pearl

- 1.1–9.7% prevalence
- almost 70% at upper wisdom-teeth.

Moskow BS, Canut PM. Studies on root enamel. (2) Enamel pearls. A review of their morphology, localization, nomenclature, occurrence, classification, histogenesis and incidence. *J Clin Periodontol* 1990: **17**:

Enamel pearl and attachment loss on first molar tooth

No enamel pearl and attachment loss on contralateral tooth

I. ANATOMICAL FACTORS

- PALATAL SULCUS OF UPPER INCISORS
- FURCATION AREAS
- ENAMEL PROJECTIONS AND PEARLS
- GINGIVAL RECESSION
- FRENULUMS

FRENUM PULL CAUSES INTERDENTAL PAPILLARY INFLAMMATION AND DESTRUCTION, ALONG WITH GINGIVAL RECESSION THEY PREVENT SUFFICIENT TOOTHBRUSHING

Gingival recession, lack of keratinized gingiva (31) : local plaque retention

1. Preoperational

2. Frenulectomy

3. Postoperational

4. Years after surgery

ETIOLOGIC FACTORS FOR THE DEVELOPMENT OF DENTAL PLAQUE

II. DENTAL POSITIONAL ANOMALIES AND OTHER PATHOLOGICAL LESIONS

- CROWDING OF THE TEETH
- OPEN CONTACT POINT
- OCCLUSAL ANOMALIES
- CARIES
- (DENTAL CALCULUS ??)

II. DENTAL POSITIONAL ANOMALIES AND OTHER PATHOLOGICAL LESIONS

- CROWDING OF THE TEETH
- OPEN CONTACT POINT
- OCCLUSAL ANOMALIES
- CARIES
- (DENTAL CALCULUS ??)

The interradicular septum is weakly developed between the crowded teeth, the papilla is thin or often missing and associated with mucogingival disorders. Oral hygiene is difficult

Túl szoros fog kontaktus:

- Cleaning problem
- Mucogingival problem

II. DENTAL POSITIONAL ANOMALIES AND OTHER PATHOLOGICAL LESIONS

- CROWDING OF THE TEETH
- OPEN CONTACT POINT
- OCCLUSAL ANOMALIES
- CARIES
- (DENTAL CALCULUS ??)

LEADS TO FOOD IMPACTION

II. DENTAL POSITIONAL ANOMALIES AND OTHER PATHOLOGICAL LESIONS

- CROWDING OF THE TEETH
- OPEN CONTACT POINT
- OCCLUSAL ANOMALIES
- CARIES
- (DENTAL CALCULUS ??)

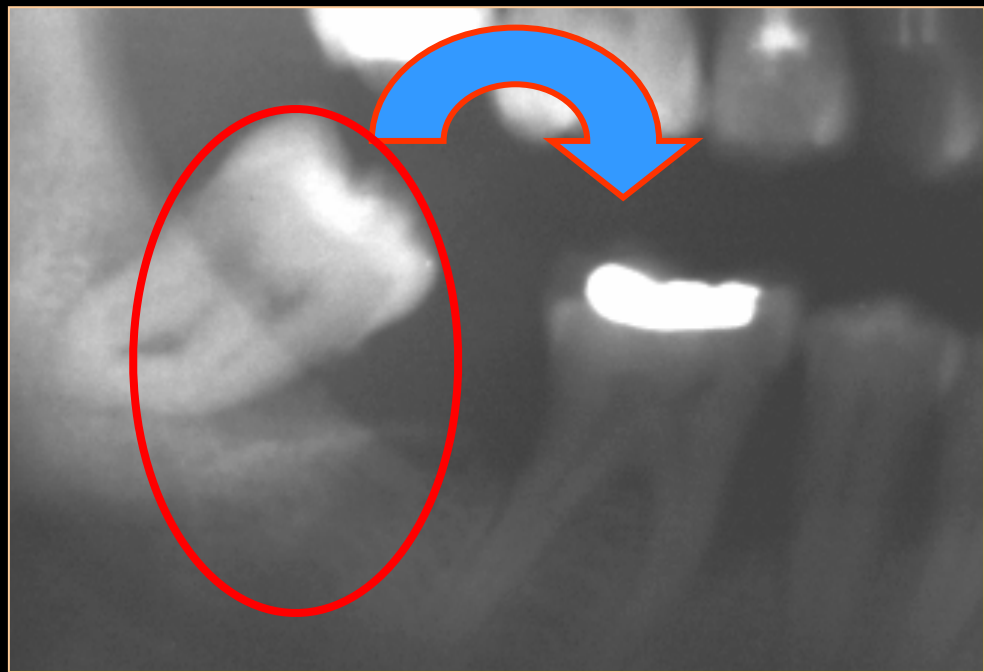
TRAUMATIC OCCLUSION IS NOT A DIRECT ETIOLOGIC FACTOR FOR PERIODONTITIS

CAUSING DEGENERATIVE CHANGES IN THE DEEP PERIODONTAL STRUCTURES. THE INFLAMMATORY PROCESS IS ALLOWED TO SPREAD APICALLY MORE RAPIDLY, RESULT IN MORE SEVERE PERIODONTAL DESTRUCTION

II. DENTAL POSITIONAL ANOMALIES AND OTHER PATHOLOGICAL LESIONS

- CROWDING OF THE TEETH
- OPEN CONTACT POINT
- OCCLUSAL ANOMALIES
- CARIES
- (DENTAL CALCULUS ??)

MESIAL DRIFTING, TILTING CAN LEAD TO OCCLUSAL DISHARMONIES AND INCREASED PLAQUE FORMATION



II. DENTAL POSITIONAL ANOMALIES AND OTHER PATHOLOGICAL LESIONS

- CROWDING OF THE TEETH
- OPEN CONTACT POINT
- OCCLUSAL ANOMALIES
- CARIES
- (DENTAL CALCULUS ??)

Ainamo (1970) drawed attention first to the strong relation between the GI values and caries

Ainamo J.: Concominant periodontal disease and dental caries in young adult males. Suomen Hammaslaakariseuran Toimituksa 66:303, 1970.

Dental caries

Dental caries AROUND THE SULCUS enhace plaque retention promoting periodontal disease.

Dental calculus ?

Sterile calculus of its own would not cause inflammation!

The rough surface of calculus is always covered by fresh, vital biofilm and bacterial aggregation. There is strong correlation between the amount of calculus and the severity and incidence of gingival inflammation.

ETIOLOGIC FACTORS FOR THE DEVELOPMENT OF DENTAL PLAQUE

I. ANATOMICAL FACTORS

II. DENTAL POSITIONAL ANOMALIES AND OTHER PATHOLOGICAL LESIONS

III. IATROGENIC FACTORS

Close association between iatrogenic factors and periodontal disease have been recognised since 1900's (Black 1912). Epidemiological as well as clinical experimental studies have repeatedly documented these relationships.

ETIOLOGIC FACTORS FOR THE DEVELOPMENT OF DENTAL PLAQUE

III. IATROGENIC FACTORS

a) ORTHODONTIC APPLIANCE

b) DENTAL MATERIALS AND PLAQUE RETENTION

c) RESTORATION QUALITY, PROCEDURES

d) POSITION OF THE CROWN MARGIN

e) PONTIC DESIGN

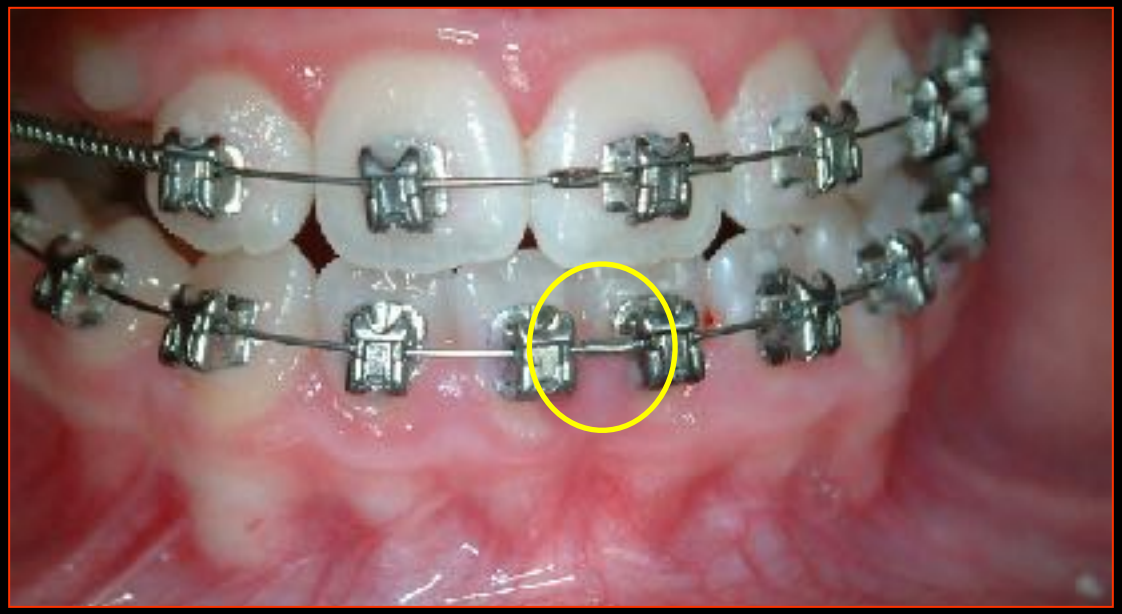
f) CONTOUR OF RESTORATIONS

g) TEMPORARY RESTORATIONS

h) OTHERS

III. IATROGENIC FACTORS

A. ORTHODONTIC APPLIANCE



III. IATROGENIC FACTORS

B. DENTAL MATERIALS AND PLAQUE RETENTION

Most of the dental materials accumulate and retain plaque more than enamel and dentin

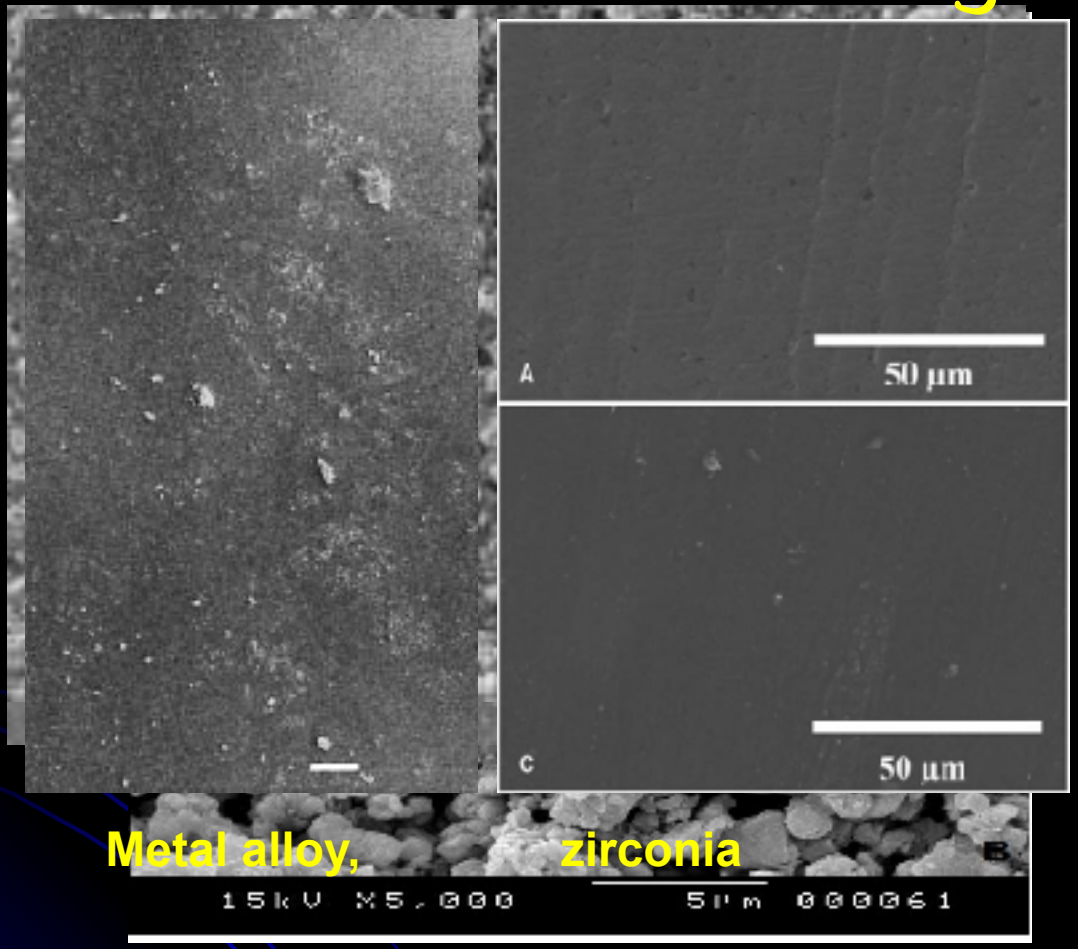
B. FOGPÓTLÁSOK ANYAGA ÉS A PLAKK RETENCIÓ

COMPOSITE

GLASS IONOMER

THE PLAQUE RETENTIVE PROPERTY OF A DENTAL MATERIAL DEPENDS ON SURFACE POROSITY

SEM images



Glass ionomer

Composite

Porcelain

Glassionomer Composite Porcelain Metal alloy, zirconia

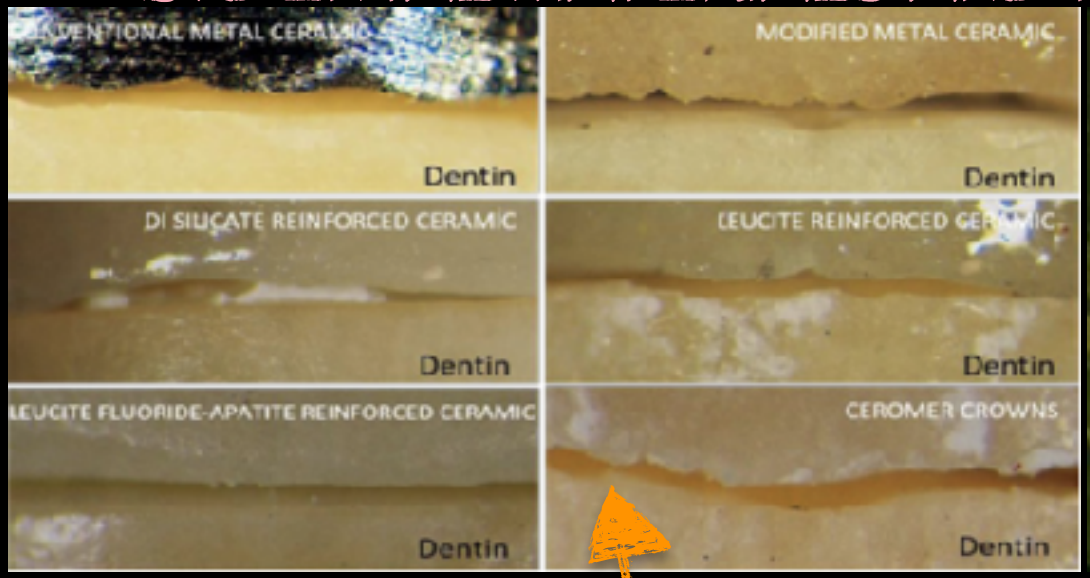
Smoothness

CROWNS MADE WITH METAL- OR ZIRCONIUM MARGIN ARE THE LESS PLAQUE RETENTIVE

- Dental gold foil and porcelain irritate tissues hardly if at all.
- The degree of porosity is directly dependent upon the way the materials were handled and finished.
- Precious metal alloys can be perfectly polished

III. IATROGENIC FACTORS

B. DENTAL MATERIALS AND PLAQUE RETENTION



TRANSITION ZONE=

PREDILECTION SITE

NO COMMERCIALLY AVAILABLE LUTING CEMENT PROVIDES A PERFECT SEAL, THE SURFACE OF THE CEMENT IS ALWAYS ROUGH AND POROUS.

Waerhaug's histological investigations have shown that subgingival cement roughness enhances plaque accumulation.

III. IATROGENIC FACTORS

C. RESTORATION QUALITY (marginal fit)

PERIO-PROTHETIC RELATIONS

Black stated as far back as in 1912, that the inadequate marginal crown-fit is responsible for the presence of gingivitis.

He found in patients, from 20 to 35 years old, that from 1820 inflamed areas, 663 had inadequate margins and 421 had inadequate contact to the adjecent teeth.

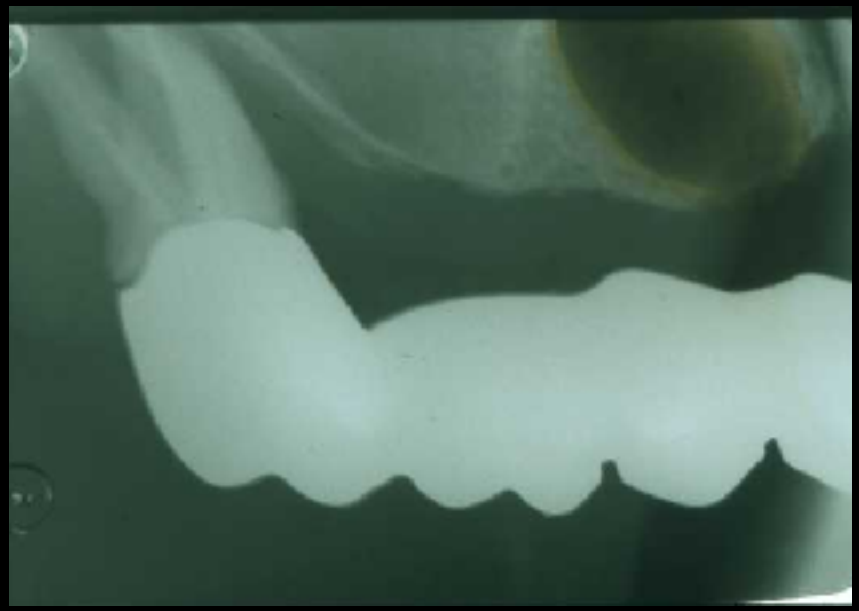
III. IATROGENIC FACTORS

C. RESTORATION QUALITY (marginal fit)

BJORN ET AL. RADIOGRAPHIC EXAMINATION:

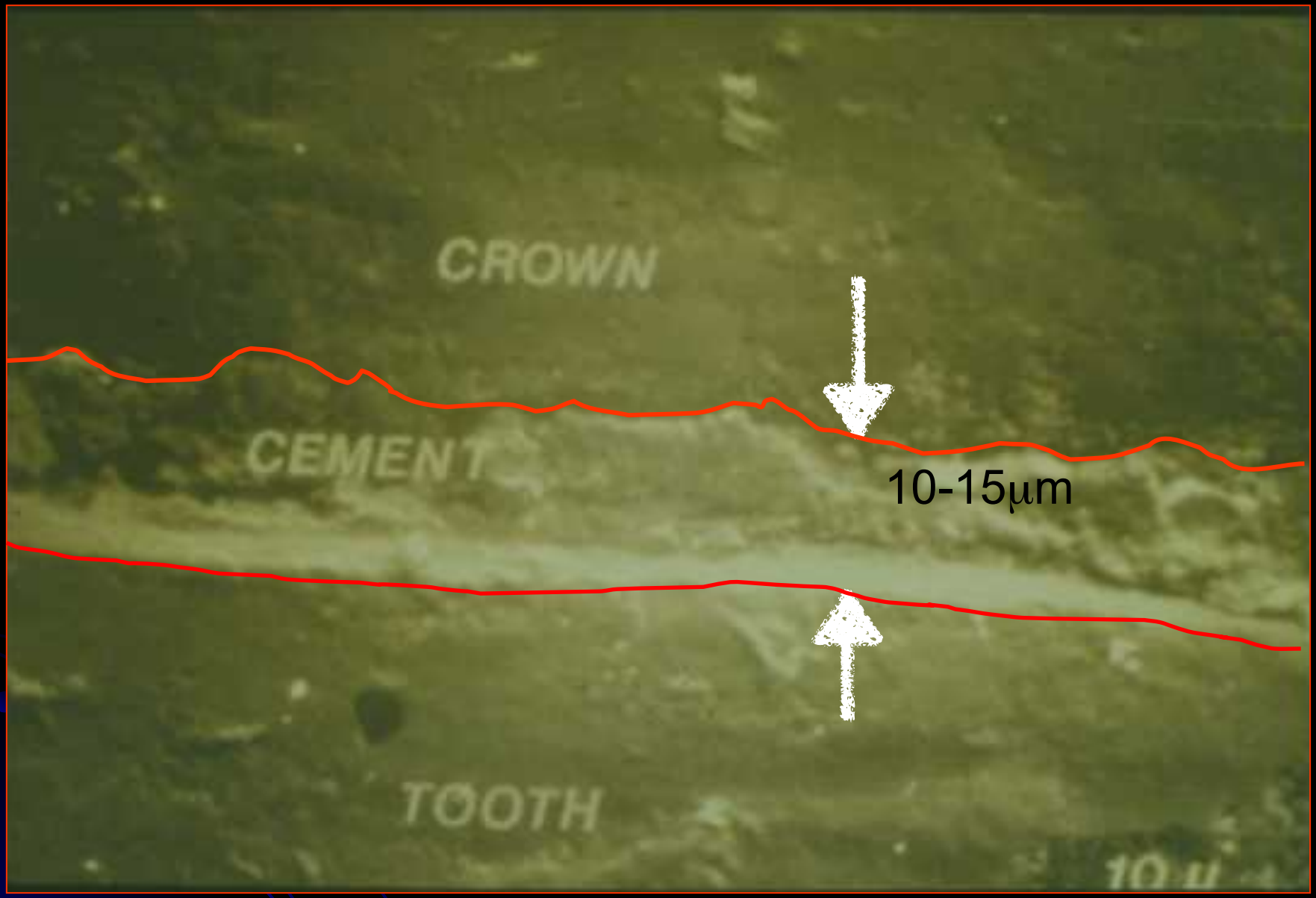
80% OF THE RECONSTRUCTIONS EXHIBITED MARGINAL DEFECTS.

OVERHANG



OPEN MARGIN

MARGIN WITH OPEN EDGE



THE OBTAINABLE BEST CROWN EDGE ADAPTATION IS 10- 20μm

(however, the gap is often between 1000-2000μm!!!)

CROWN MARGIN WITH OVERHANGS

III. IATROGENIC FACTORS

C. RESTORATION QUALITY (marginal fit)

PERIO-PROTHETIC RELATIONS

The World Workshop in Periodontics (1966) reported that the overhanging at the margins of a restoration are local factors promoting periodontitis.

Teeth with inadequate restorations had significantly more plaque, gingivitis and periodontal pocket formation than adequately restored teeth. For both amalgam and crown restorations, the health of the periodontium is adversely affected by the presence of a restoration.

Grasso JE, Nalbandian J, Sanford C, Bailit H. Effect of restoration quality on periodontal health. J Prosthet Dent. 1985 Jan;53(1):14-9.

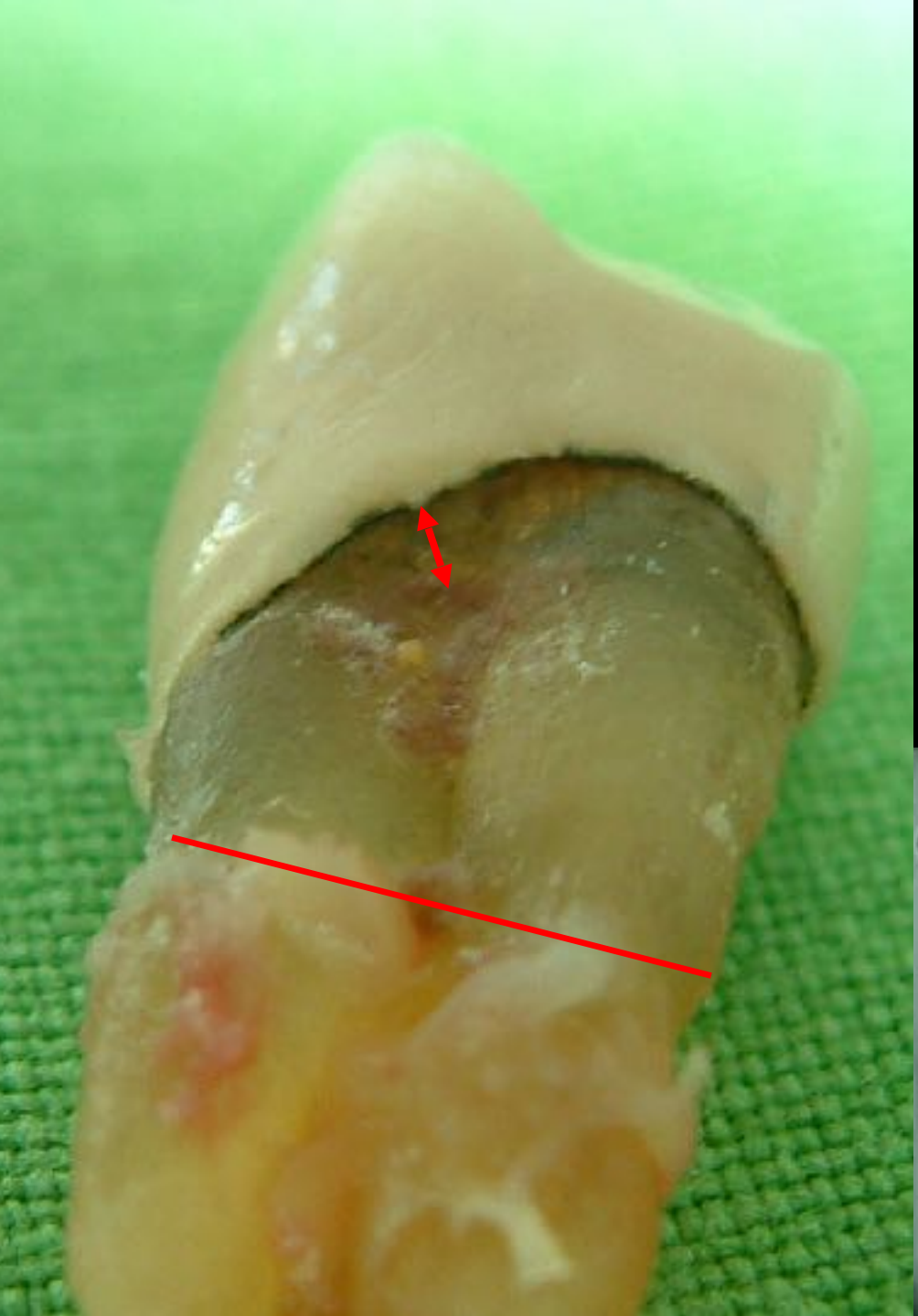
BACTERIAL SAMPLES GATHERED UNDER OVERHANGING MARGINS SHOWED HIGH CORRELATION WITH PERIODONTOPATHOGENIC ORGANISMS, GRAM-NEGATIVE ANAEROBIC BACTERIAS (Porphyromonas, Prevotella, Fusobacterium)

THE OVERHANGING RESTORATIONS DISTURB THE ECOLOGICAL BALANCE IN THE PERIODONTAL POCKET AND ALLOW A GROUP OF DISEASE ASSOCIATED ORGANISMS.

SAMPLES COMING FROM THE CLINICALLY PERFECT MARGINS WERE CHARACTERISTIC OF GINGIVAL HEALTH.

Lang P. N., Kiel A. R. , Anderhalden: Clinical and microbiological effects of subgingival restorations with overhangings or clinically perfect margins. J. Clini Periodontol 1983; 10: 563-578

The subgingivally located overhanging crown- and filling margins result periodontal attachment loss in patients with susceptibility.



III. IATROGENIC FACTORS

C. RESTORATION QUALITY:

Procedure steps on order to ensure proper marginal fit

Preparation → Impression → Cementation

PREPARATION:

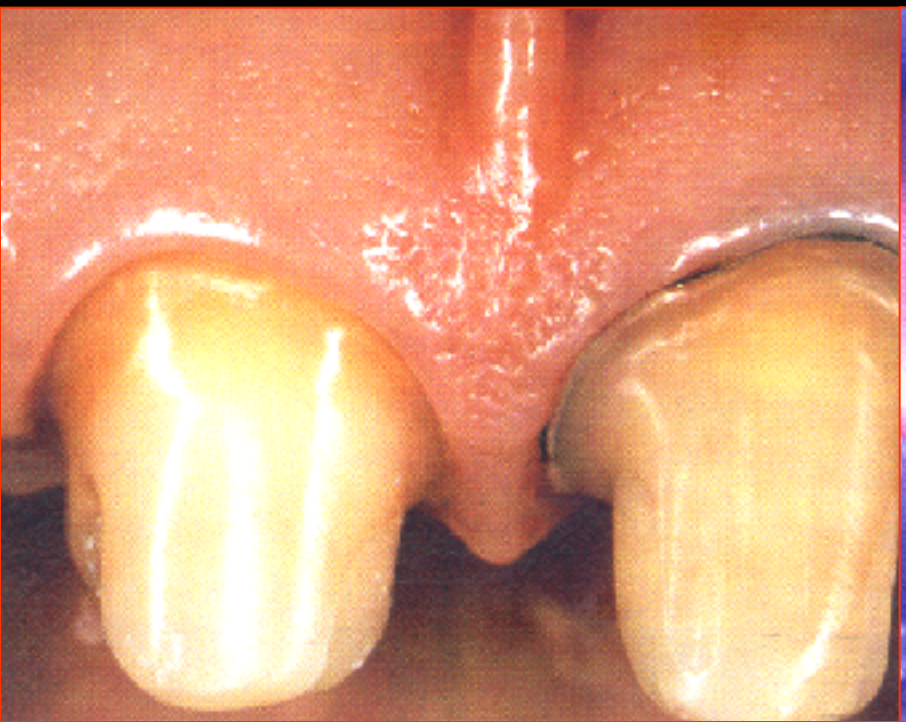
✓ Shoulder

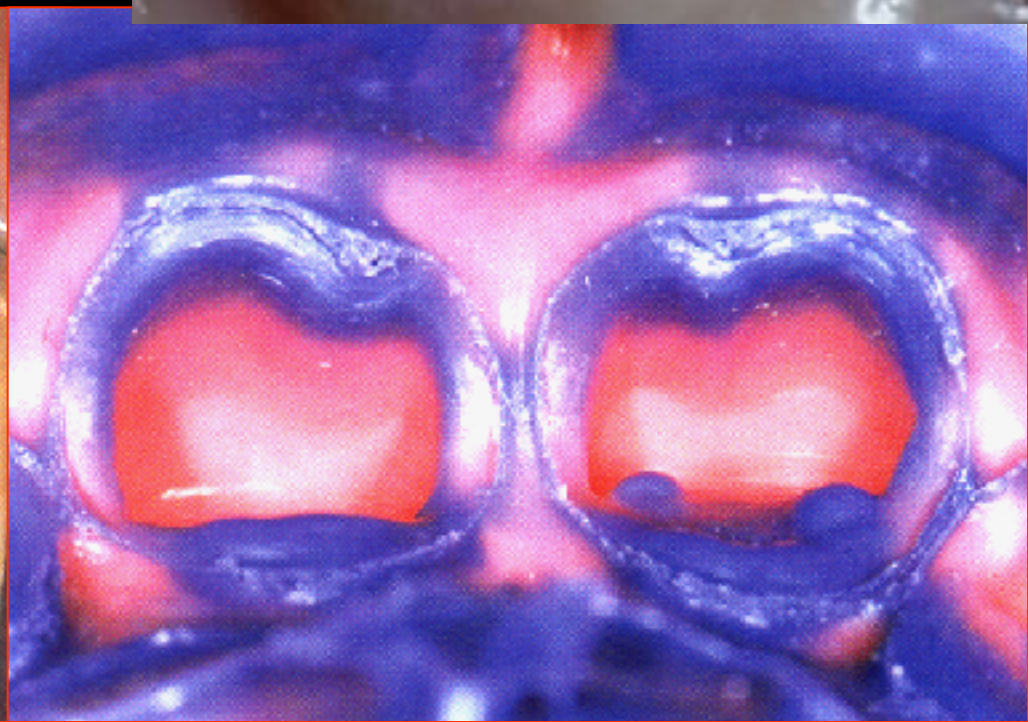
✓ Supra- or paragingival

✓ contour-preparation

IMPRESSION:

✓Correct sulcus retraction



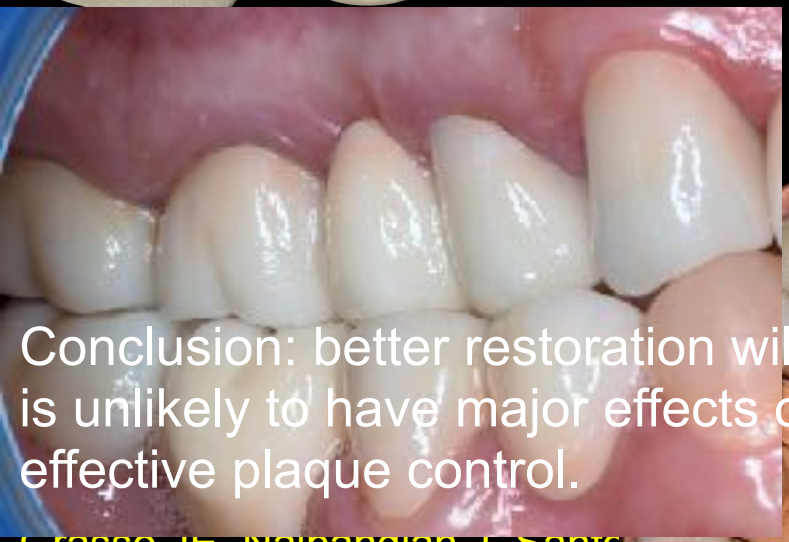


CEMENTATION

- ✓ PROPER REMOVAL OF LUTING AGENT

- ✓ RETRACTION CORN IN CASE OF SUBGINGIVAL MARGIN

ACCEPTABLE QUALITY



Conclusion: better restoration will help, but improving restorative quality alone is unlikely to have major effects on the health of the periodontium without effective plaque control.

Grasso JE, Nalbandian J, Sanfc … uality on periodontal health. J Prosthet Dent. 1985 Jan;53(1):1

AFTER CEMENTATION

III. IATROGENIC FACTORS

D. THE POSITION OF THE CROWN MARGIN: SUPRA- OR SUBGINGIVAL???

BLACK'S THEORY (1908): „EXTENSION FOR PREVENTION" ≈ SUBGINGIVALY PLACED MARGINS

III. IATROGENIC FACTORS

D. THE POSITION OF THE CROWN MARGIN:

SUPRA- OR SUBGINGIVAL???

SECONDARY CARIES ????

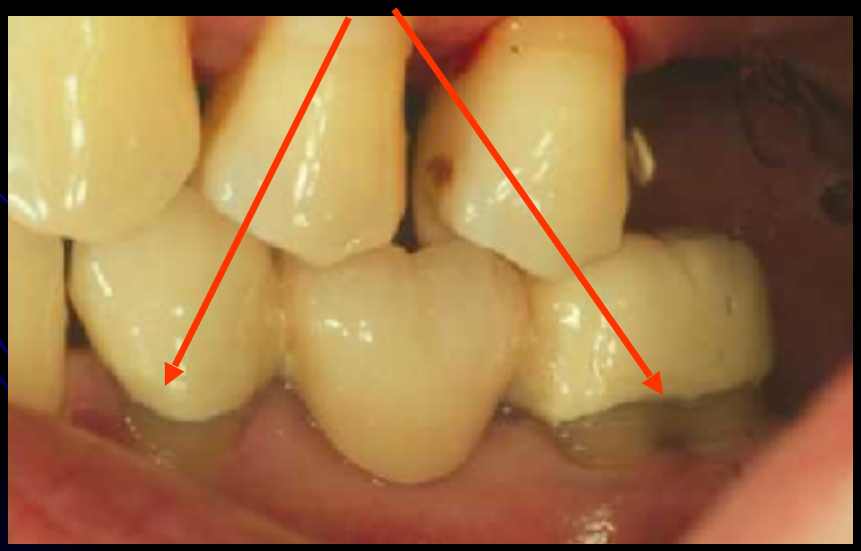
- There is no significant difference in the incidence of secunder caries comparing the supra- and subgingivally positioned crown margins.
- From a secunder caries preventive point of view, the location of crown margins does not seem to be of great importance, if the patient maintains a satisfactory oral hygiene.

Valderhaug J., H.Loe .: Oral hygiene in a group of supervised patients with fixed prosthesis. J. Periodontol. 1977; 48:221- 224

III. IATROGENIC FACTORS

D. THE POSITION OF THE CROWN MARGIN: SUPRA- OR SUBGINGIVAL???

1. Bodecker and Applebaum (1934) were the first to question black's theory.
2. Waerhaug (1967, 1968) gave scientific proof that subgingival crown margins create periodontal destruction due to plaque retention.
3. Loe(1968), Zander and Kennedy (1970) supported the position of the crown margins above the free gingiva.



SUPRA- OR SUBGINGIVAL CROWN MARGIN?

SUPRAGINGIVAL

SUPRA- OR SUBGINGIVAL CROWN MARGIN?

SUBGINGIVAL (without shoulder preparation

SUPRA- OR SUBGINGIVAL CROWN MARGIN?

Experimental studies have shown that the supragingival margins should be chosen whenever possible. Crowns made earlier with subgingival margin should be transformed to supragingivally location, with the use of an apically transpositioned flap or with a crown margin correction.

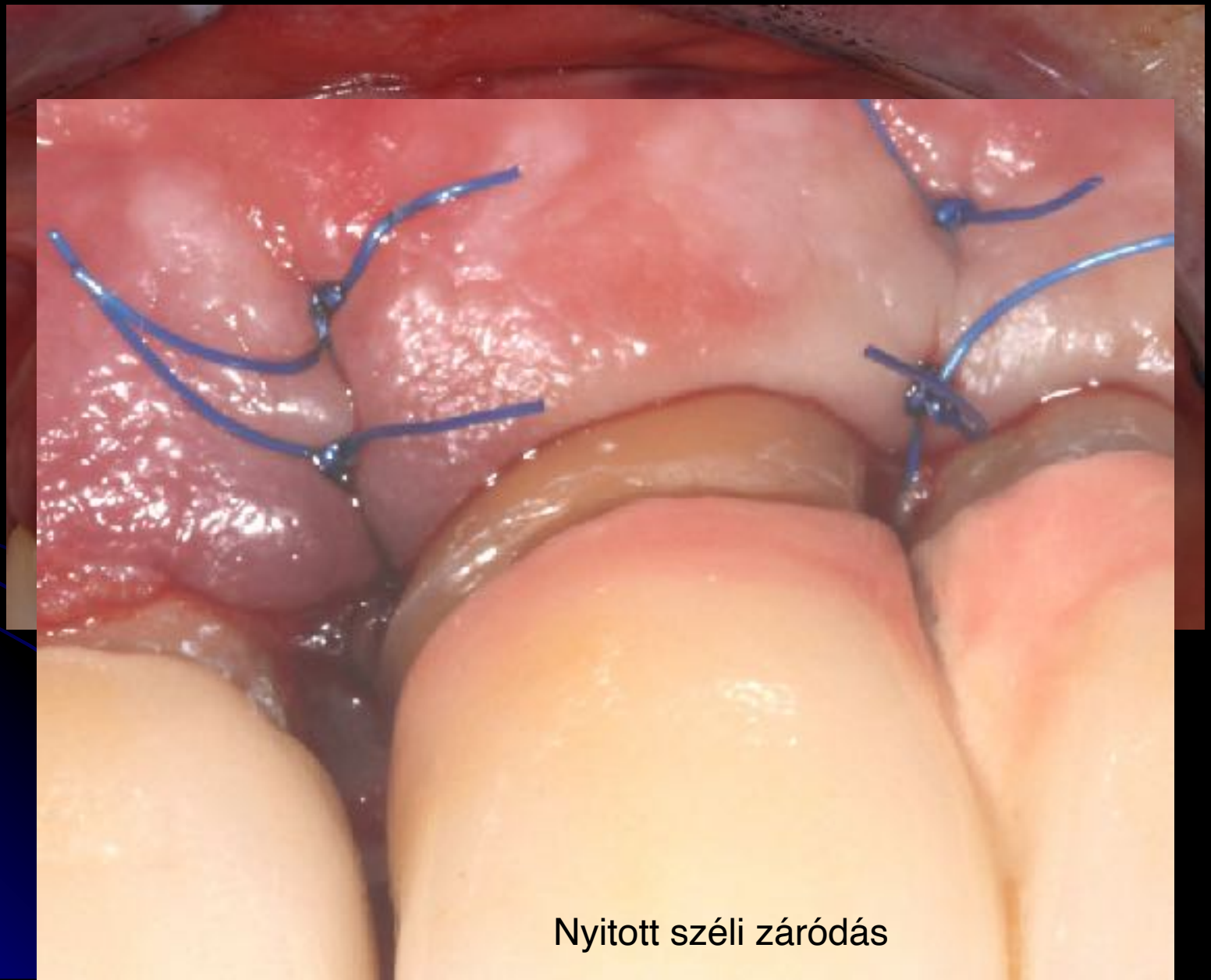
APICALLY TRANSPOSITIONED FLAP

CROWN MARGIN CORRECTION

Morman W. et al.: Gingival reaction to well fitted subgingival proximal gold inlays. J. Clin. Periodontol. 1:120, 1974.

Newly made subgingivally placed crowns, but with shoulder preparation

Apically transpositioned flap



Nyitott széli záródás




PHYSIOLOGICAL BIOLOGICAL WIDTH

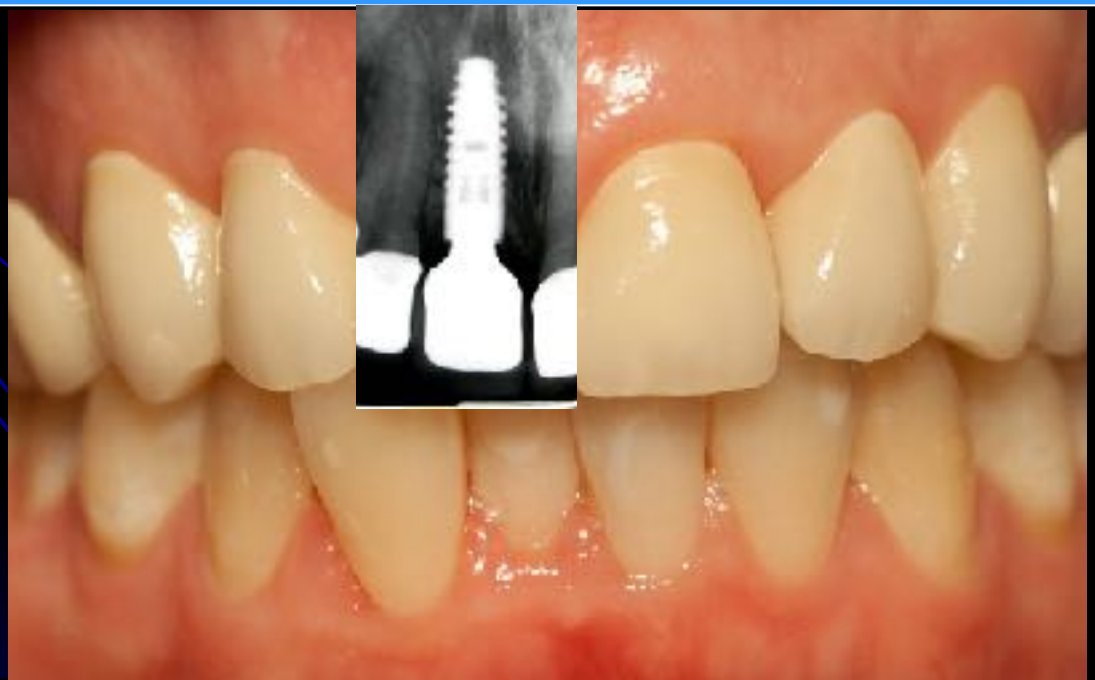
sulcus	0.5- 2 mm
Epithelial attachment	~1 mm
Connective tissue attachment	0.7- 1.0mm
Alveolar bone	

Gargiulo A, Wentz F, Orban B. Dimensions and relations of the Dentogingival Junction in Humans. J Periodontol 1961;

VIOLATION OF THE BIOLOGICAL WIDTH

MINIMAL GINGIVAL RECESSION WITHIN 1 YEAR AFTER LUTING

ALTHOUGH ESTHETICALLY PLEASING, SUBGINGIVAL CROWN MARGINS ARE CONSIDERED BIOLOGICAL UNDESIRABLE, BUT CAN BE DONE IF THE QUALITY IS PERFECT!!



Today supragingival margins can provide excellent aesthetic results!

III. IATROGENIC FACTORS

E. PONTIC DESIGN AND IT'S CORRELATION TO THE EDENTULOUS MUCOSAL AREA

PONTIC DESIGN

IATROGENIC

IDEAL

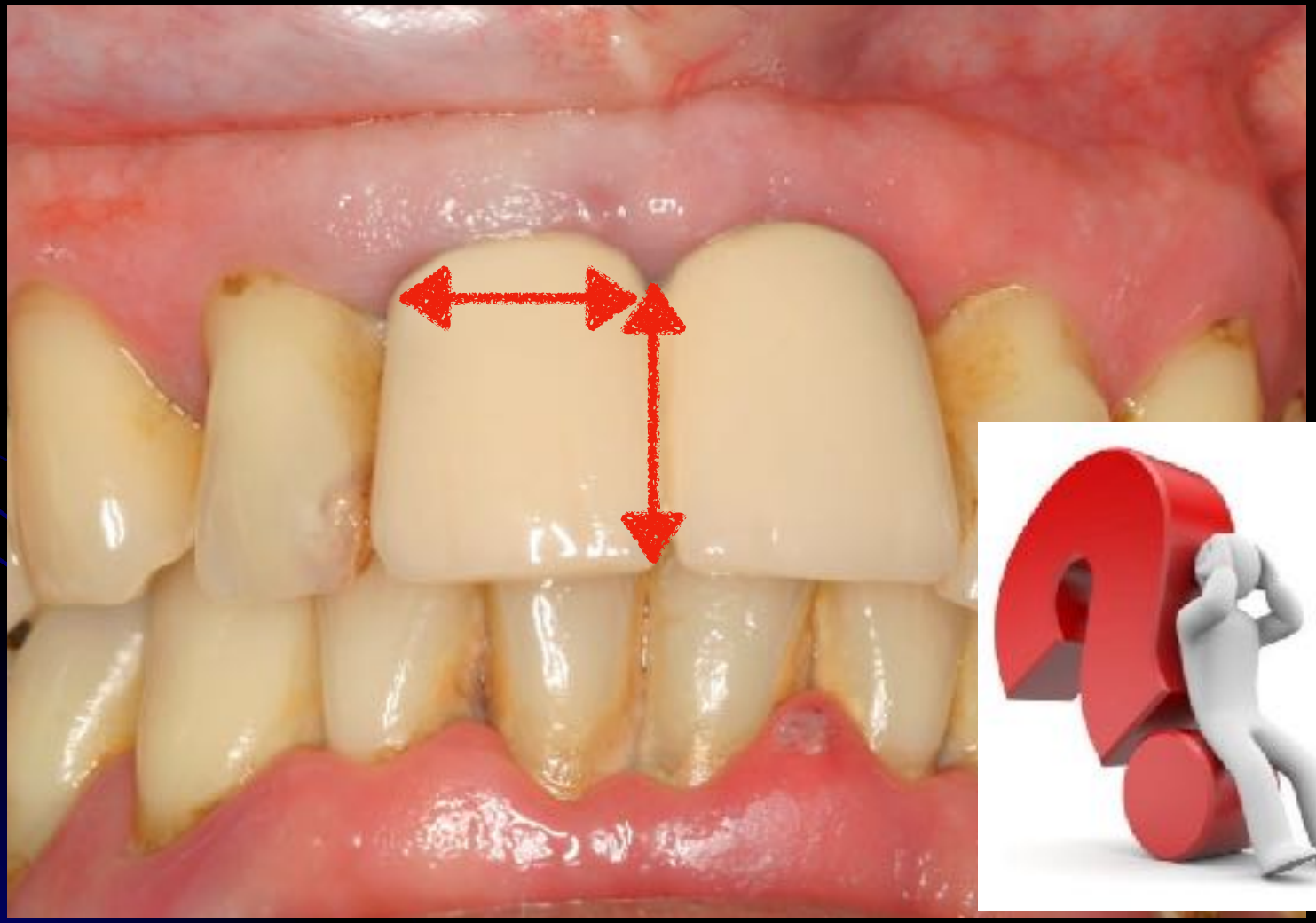
Gingival inflammation or ulceration, hyperplasia of the underlying soft tissues

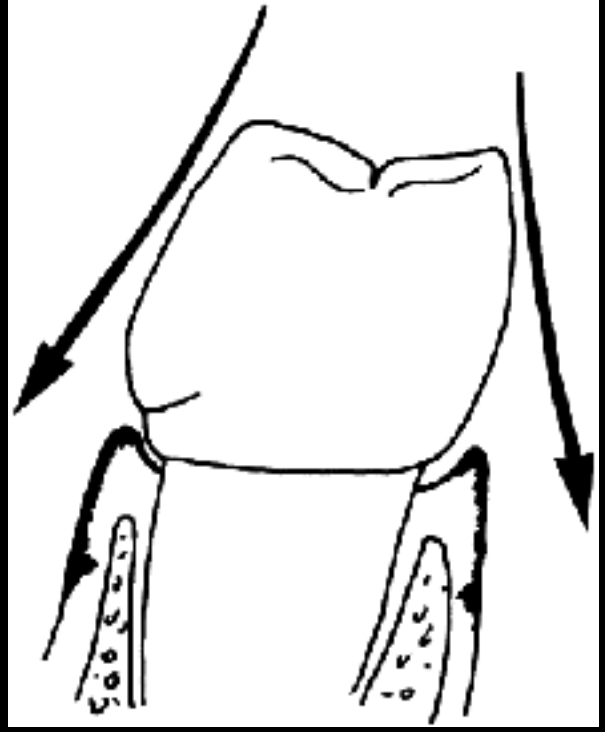
Convex, egg shape gingival surface, slightly touching the gingiva

III. IATROGENIC FACTORS

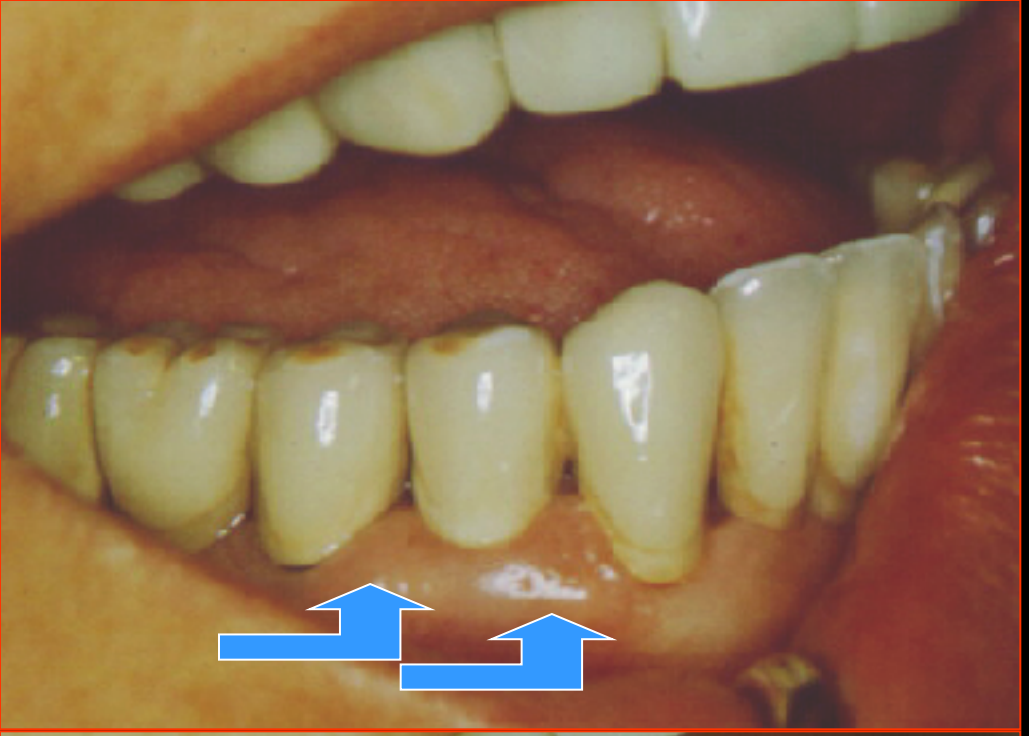
F. CONTOUR OF RESTORATIONS

(DESIGN OF THE CERVICAL AREA AND CONNECTION PART)



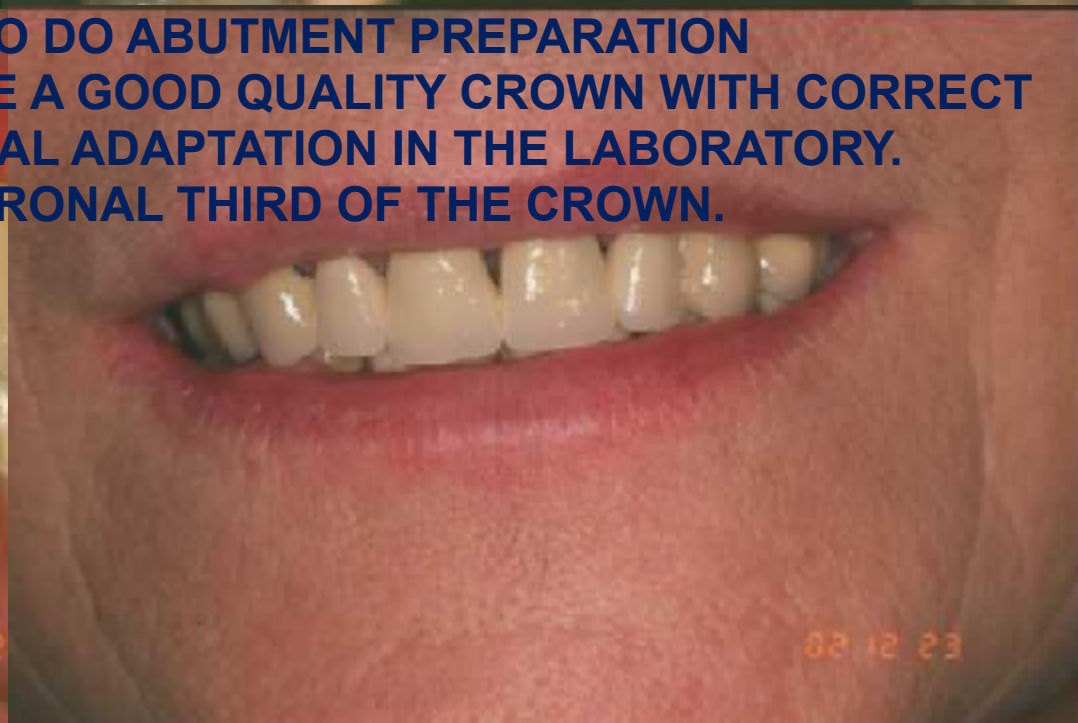


- GINGIVAL PROTECTION THEORY: OUT OF DATE, DOES NOT PROTECT SULCUS FROM FOOD IMPACTION!!
- SCHLUGER: „THE SO CALLED PROTECTIVE CERVICAL CONVEXITY PROTECTS NOT THE GINGIVA, RATHER THE DENTAL PLAQUE BEDDING
- THERE ARE NO SELF-CLEANSING MECHANISMS AROUND THE SULCUS
- ORAL HYGIENE PRACTICES MAY BE SEVERELY JEOPARDIZED BY OVERCONTOURED RESTORATIONS



- THE INTERDENTAL AREAS OF CROWNS AND BRIDGES SHOULD BE ACCESSIBLE WITH INTERDENTAL BRUSHES OR WITH SUPERFLOSS
- TO ENSURE THIS WE HAVE TO CREATE ADEQUTE INTERDENTAL SPACES
- CORRECT CONTACTPOINTS! (EVEN THE QUITE HUGE INTERDENTAL AREAS WILL NOT LEAD TO FOOD IMPACTION)

THE CORRECT CONTOUR OF THE CROWNS DEPEND NOT ONLY ON DENTAL TECHNICIANS, DENTISTS HAVE TO DO ABUTMENT PREPARATION ADEQUATELY IN ORDER TO MAKE A GOOD QUALITY CROWN WITH CORRECT CONTOUR AND PROPER MARGINAL ADAPTATION IN THE LABORATORY. CONTACTPOINTS ARE IN THE CORONAL THIRD OF THE CROWN.



OVERCONTOURED CROWN MARGIN WITH SEVERE OVERHANG

CLASS II. FURCATION LAESION TOTALLY COVERED BY OVERHANGING CROWN MARGIN

COVERING THE GINGIVAL RECESSION WITH OVERCONTOURED CROWN MARGIN WITH SEVERE OVERHANG

THE WHOLE DENTAL PROBE CAN BE PUT UNDER THE CROWN MARGINE!!!!!!

Furcation areas: root concavities are one of the most susceptible to plaque accumulation

CLASS II FURCATION LAESIONS RESTORED WITH PFM CROWNS PREPARED WITH SUPRAGINGIVAL MARGINS: contourpreparation, undercontoured, cleanable furcation access

III. IATROGENIC FACTORS

F. TEMPORARY RESTORATIONS

DUE TO THE PLAQUE-RETENTIVE PROPERTIES OF ACRYLATE, A PROVISIONAL WITH SUPRAGINGIVAL MARGINAL CLOSURE SHOULD BE MADE

The quality of the temporary restoration can not be either bad, it's margin and adaptation can neither enhance plaque accumulation.

QR code

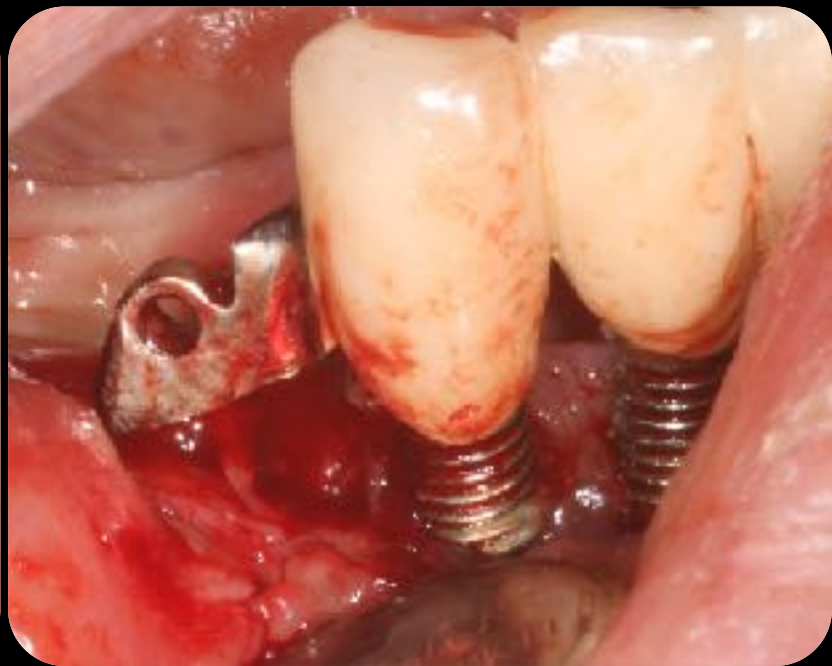
Further

aviodable

and preferable

EXAMPLES

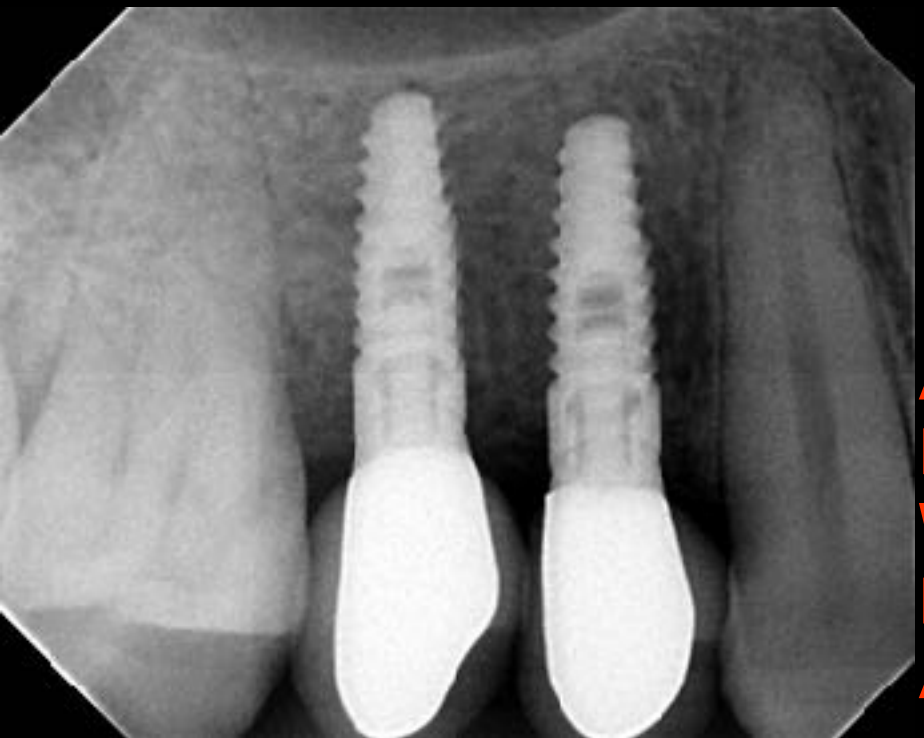
PERIIMPLANTITIS



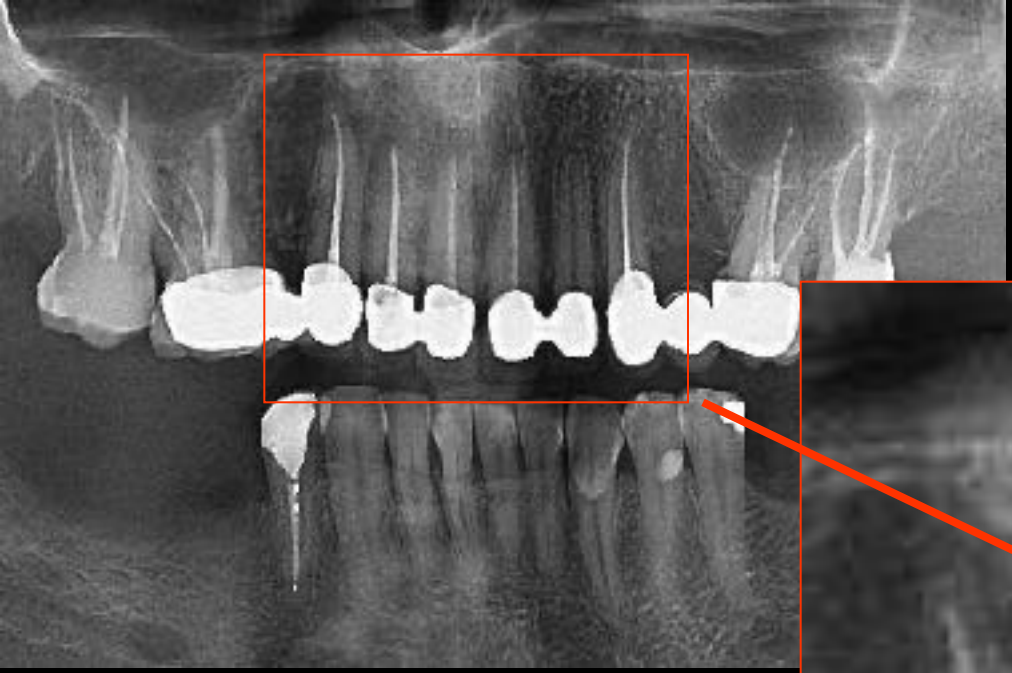


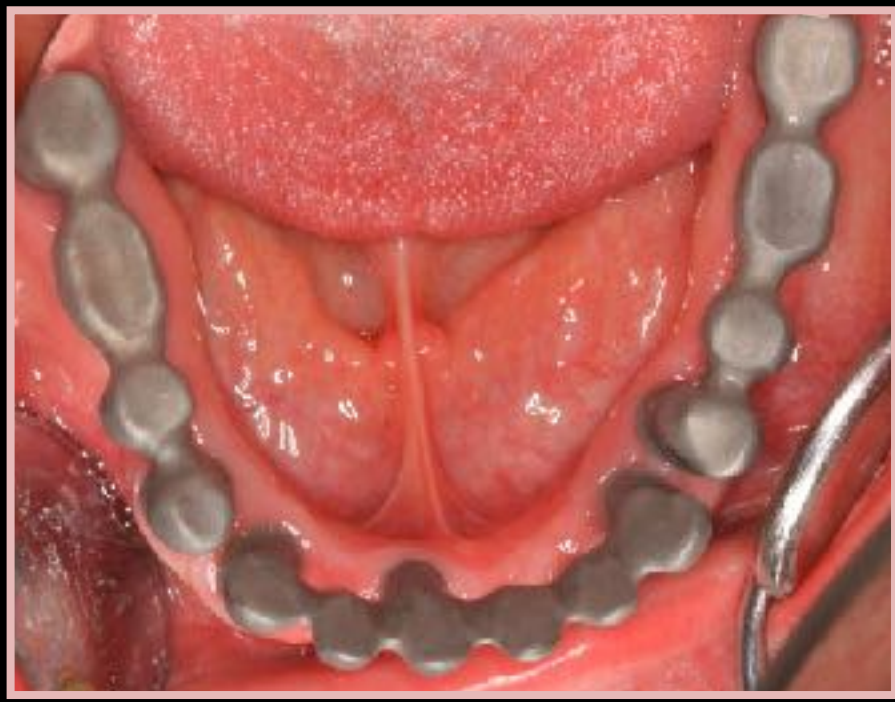




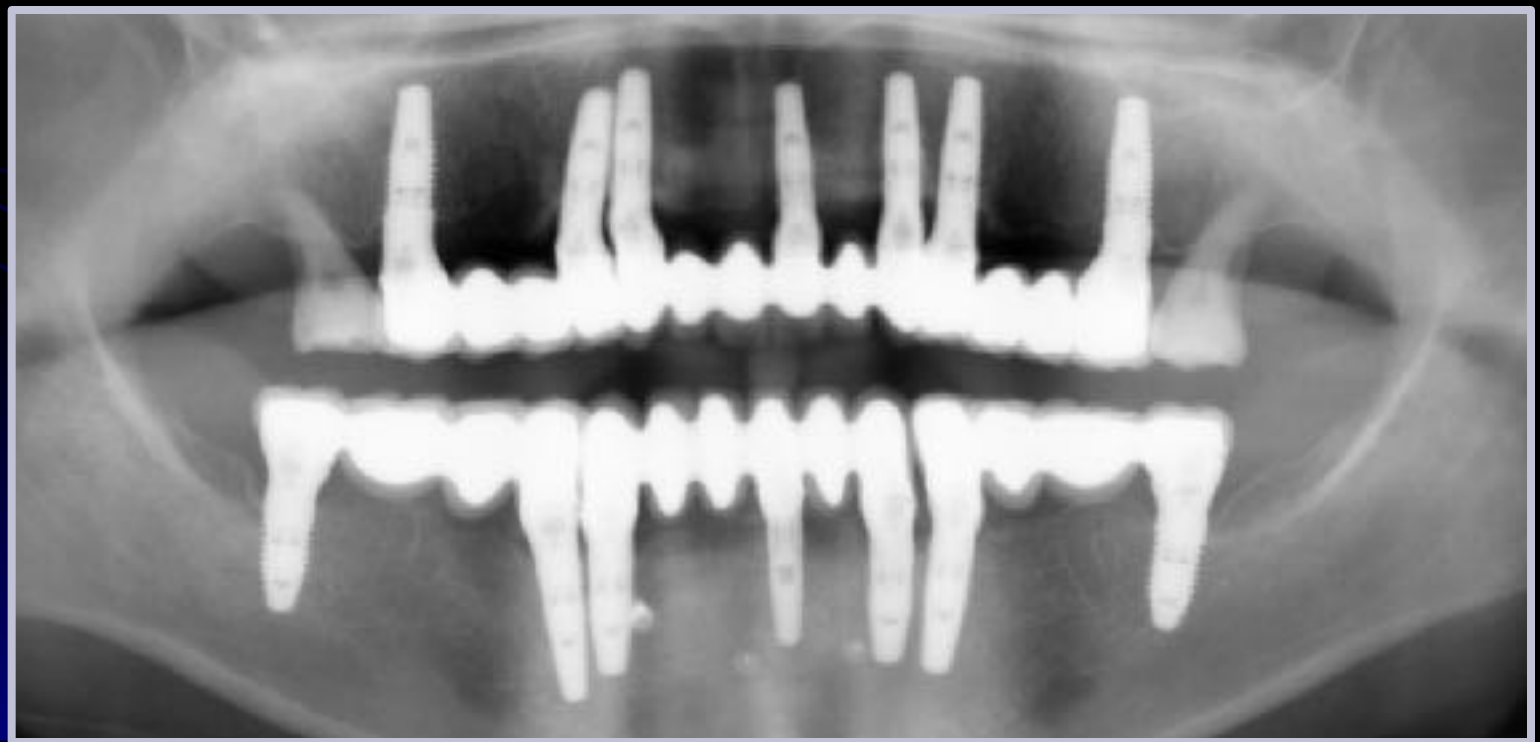


ACCEPTABLE MARGINAL FIT WITH CORRECT MARGINAL ADAPTATION





BASELINE AND FINAL



MAINTENANCE THERAPY

THANK YOU FOR YOUR KIND ATTENTION!!