# Periodontal considerations for direct/indirect restorations

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**&**

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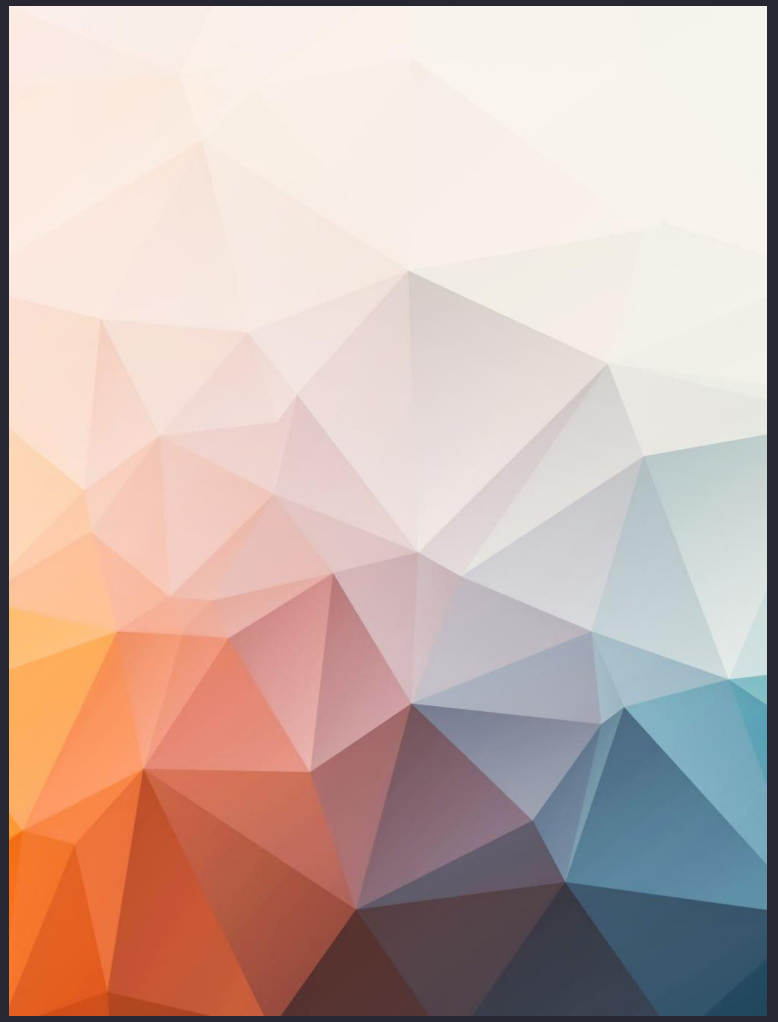
- Perio OR Resto … or …. Perio AND Resto?

Comprehensive dental therapy is founded on team works.

Interdisciplinary approach is mandatory in modern Dentistry.

Perio and Resto/Pros share an intimate and inseparable relationship in:

- Treatment plan
- Procedures execution
- Outcome achievement
- Maintenance



# Perio OR Pros … or Perio AND Pros??

- Why consider both together?

- Perio Tx aims to control biofilm and inflammation and to prepare sites for ideal prosthetic work, providing a solid foundation for successful pros outcomes and aiding in the longevity of restorations

- Pros aims to achieve proper restorative margins, shapes and contacts, in order to obtain harmony between the periodontium and reconstructions.

- Hsu et al 2015

# Perio OR Pros … or Perio AND Pros??


- **Obviously the answer is …both**

# Our lecture today …

- Impact of periodontal health on restorative therapy
- Impact of restorative factors on periodontal health
  - Margins (location and fit)
  - Biological width or supracrestal attachment maintenance
  - Contours
  - Surface finish

**Topics covered later**

- Proximal relationship( contact point/ papillary relationship)
- Retraction techniques and the periodontium
- Trauma from occlusion
- Reduced periodontium

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# Periodontal health is the *sine qua non*, a prerequisite, of successful comprehensive dentistry.

To achieve the long-term therapeutic targets of comfort, good function, treatment predictability, longevity, and ease of restorative and maintenance care, active periodontal infection must be treated and controlled before the initiation of restorative, aesthetic, and implant dentistry.

**Melnick & Takei, 2019**

## Impact of periodontal health on resto therapy

- Active disease and contributing factors should be controlled before Pros Tx
  - Biofilm control compatible with health
  - Absence of inflammatory signs
  - Absence of progressing attachment loss
  - Reduction in probing depths
- If not controlled-long term consequences may be
  - progressive attachment loss and tooth loss
  - soft tissues changes = impaired esthetic outcomes
  - Compromised prognosis (individual tooth and overall dentition)
- Soft and hard tissue management to prepare sites for Pros tx
  - E.g. Soft tissue grafts
  - E.g. Bone augmentation
- Maintenance program

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# Why do we need to establish periodontal health before performing restorative dentistry?

Tissues that do not bleed during restorative manipulation allow for a more predictable restorative and aesthetic result.

Periodontal treatment is undertaken to ensure the establishment of stable gingival margins before tooth preparation.

Non-inflamed, healthy tissues are less likely to change (e.g., shrink) as a result of subgingival restorative treatment or post-restoration periodontal care.

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# Why do we need to establish periodontal health before performing restorative dentistry?

Periodontal therapy should antecede restorative care because the resolution of inflammation may result in the repositioning of teeth or in soft tissue and mucosal changes. Failure to anticipate these changes may interfere with prosthetic designs planned or constructed before periodontal treatment.

Certain periodontal procedures are designed to provide for adequate tooth length for retention, access for tooth preparation, impression making, tooth preparation, and finishing of restorative margins in anticipation of restorative dentistry. Failure to complete these procedures before restorative care can add to the complexity of treatment and introduce unnecessary risk for failure.

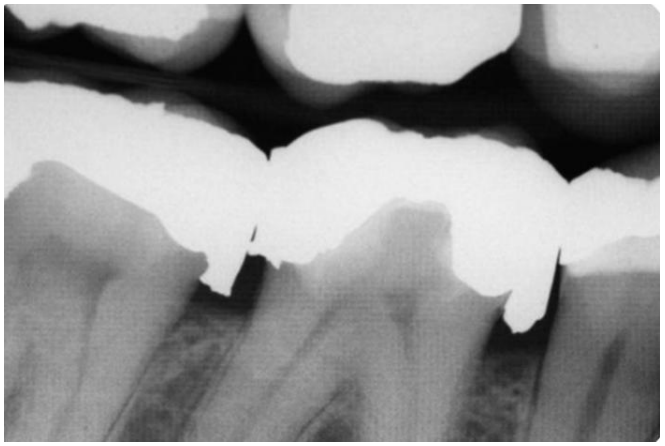
# Overhanging Restorations

- Overhanging restorations will hinder plaque removal and hence predispose to periodontal inflammation (Lang et al. 1983, Pack et al., 1990, Jansson et al. 1994, Matthews & Tabesh, 2004).

- Association between overhang restorations and a shift to the more virulent microflora and more gingivitis had been shown by Lang et al. (1983) in a study using gold onlays.

- Dental restorations, if poorly designed or compromised may be predisposing factors by retaining or hindering the removal of plaque.

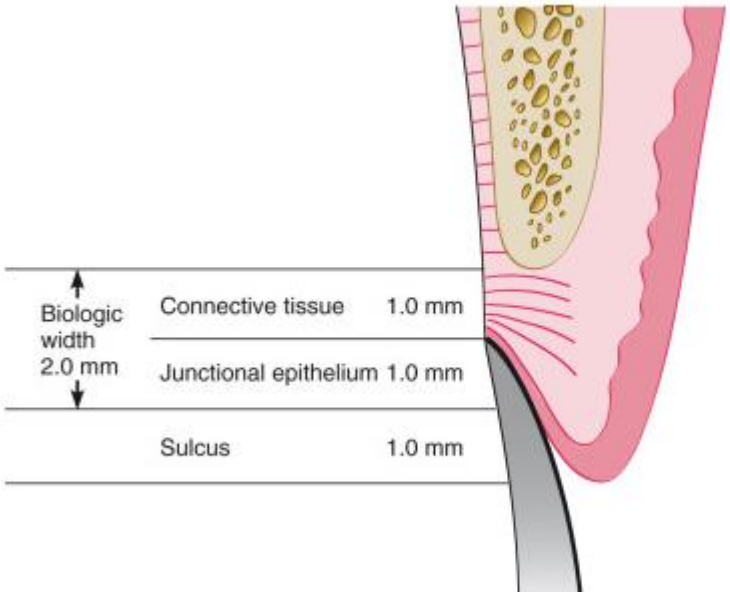
- **Defective restorations (** overhangs , poor contacts **,** deficiencies) contribute to PD establishment and progression:
    - **Increase plaque accumulation**
    - **Invasion of biological width**



# Location of restorative margins

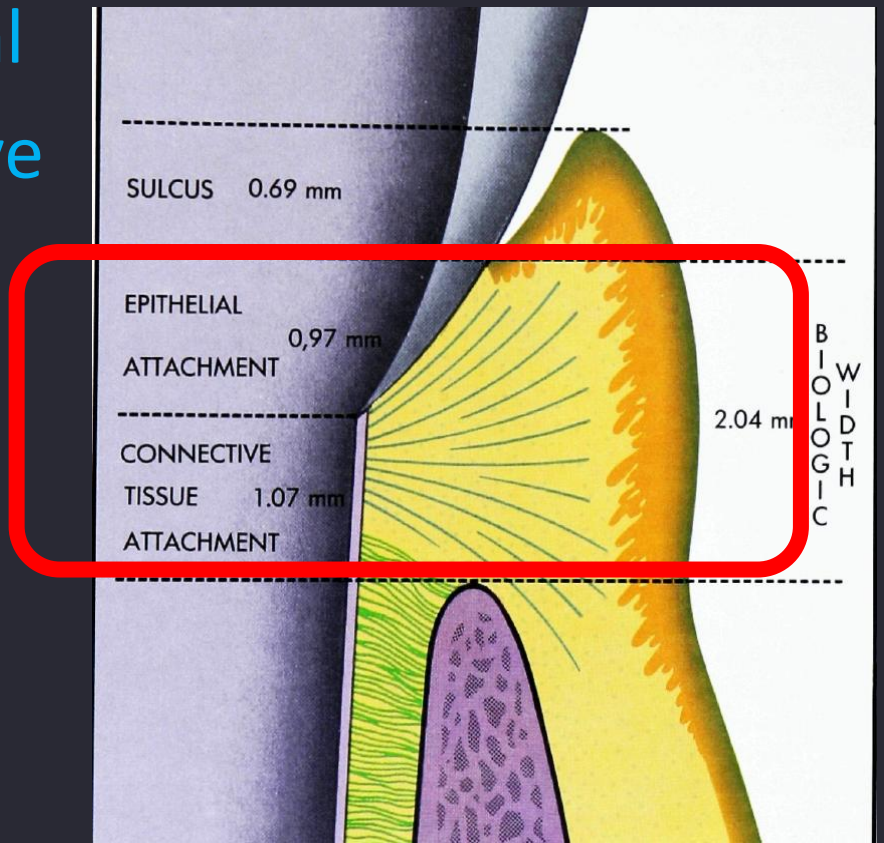
One of the most important aspects of understanding the periodontal–restorative relationship is the location of the restorative margin to the adjacent gingival tissue.

Subgingival
Equigingival
Supragingival



# BIOLOGIC WIDTH- DEFINITION

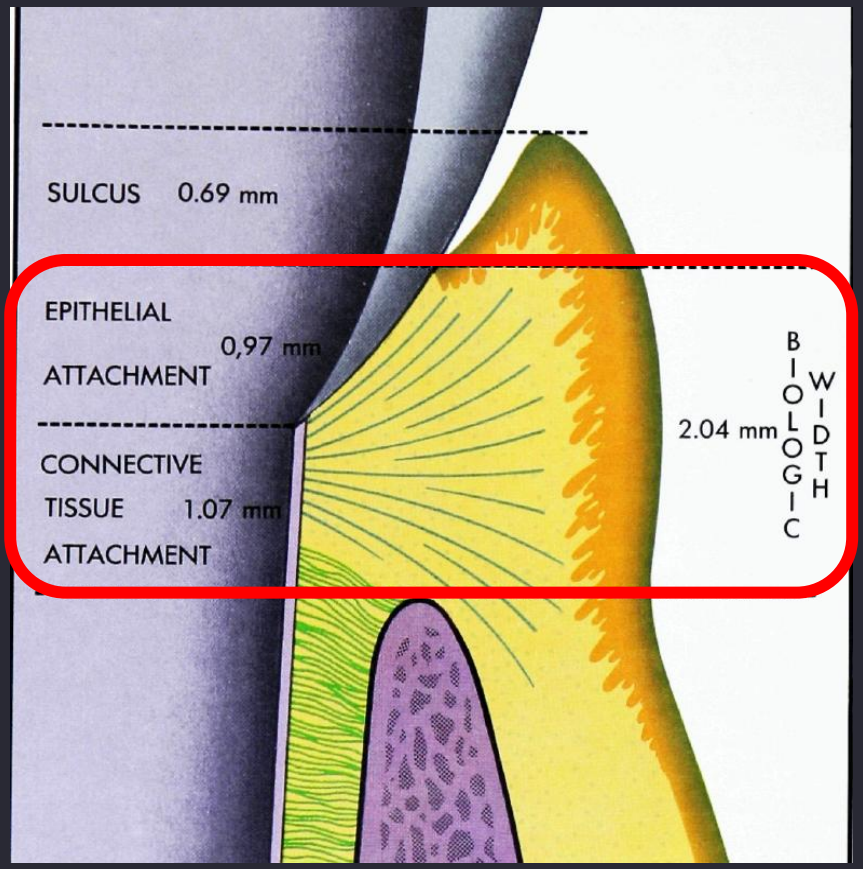
The dimension of the soft tissue attached to the portion of the tooth coronal to the crest of the alveolar bone=epithelial attachment + connective tissue attachment.



# BIOLOGIC WIDTH- DIMENSION

## Gargiulo (1961)

| | *Average Measurement in mm.* |
|---|---|
| Sulcus Depth (A) | .69 mm. |
| Length of Epithelial Attachment (B) | .97 mm. |
| Connective Tissue Attachment (F) | 1.07 mm. |




*Journal of Periodontology. 1961;32(3):261-7*

# BIOLOGIC WIDTH- DIMENSION

- Schmidt et al 2013- Biologic width dimensions
- Mean values of the biologic width ranged from 2.15 to 2.30 mm
- large intra- and inter-individual variances were observed (range: 0.2 – 6.73 mm)

No universal dimension of the biologic width appears to exist

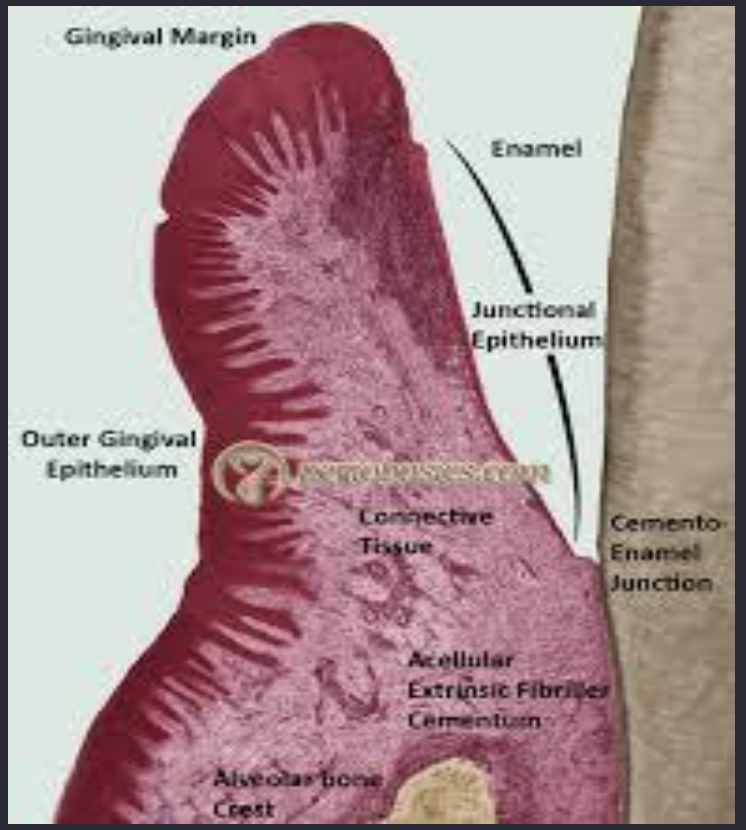
*J Clin Periodontol 2013; 40: 493–504*

# BIOLOGIC WIDTH- FUNCTION

Creates a natural seal (cuff) around teeth protecting them from microbial invasion and traumatic insult.

The Biological width should not be violated!

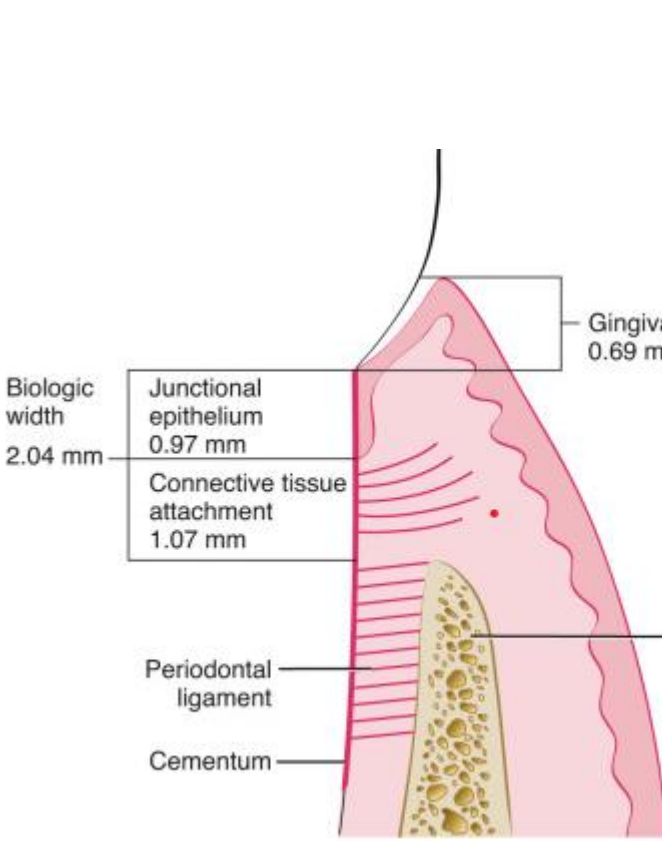
# BIOLOGIC WIDTH

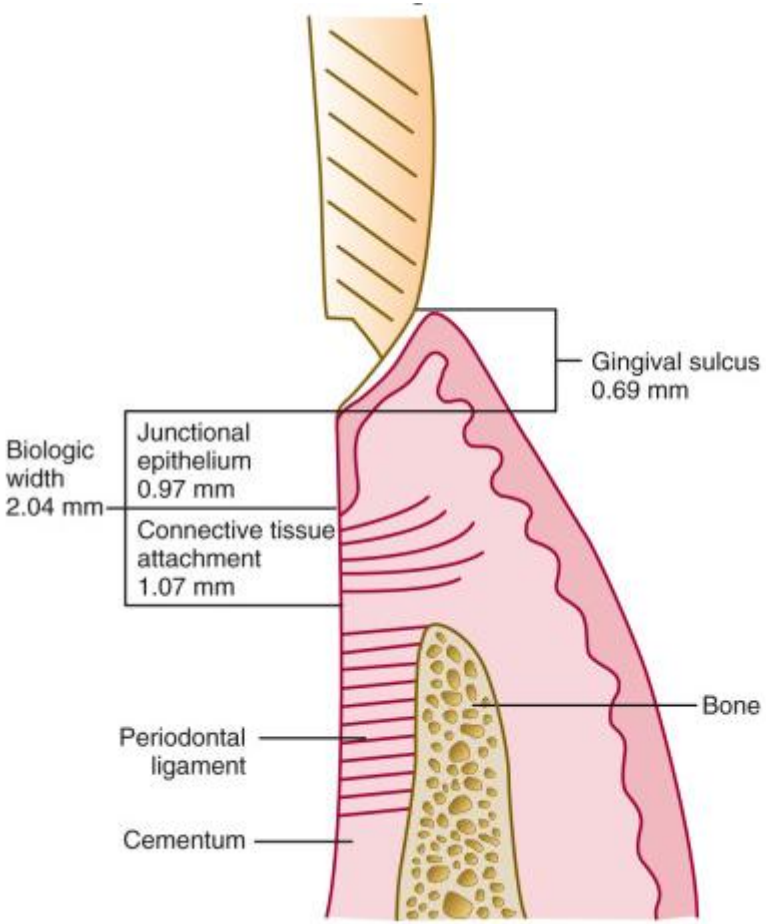


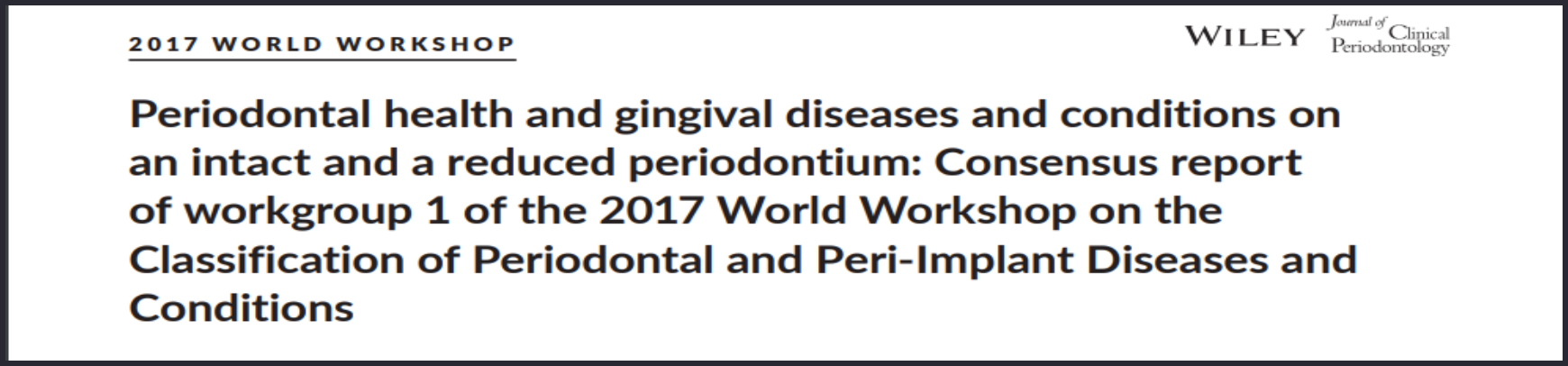

Composed of:

- Junctional epithelium- hemidesmosomes
- Connective tissue-  gingival fibers

Supra-crestal tissue attachment


Gingiv
0.69 m
Biologic
width
2.04 mm
Junctional
epithelium
0.97 mm
Connective tissue
attachment
1.07 mm
Periodontal
ligament
Cementum


Gingival sulcus
0.69 mm
Biologic
width
2.04 mm
Junctional
epithelium
0.97 mm
Connective tissue
attachment
1.07 mm
Bone
Periodontal
ligament
Cementum



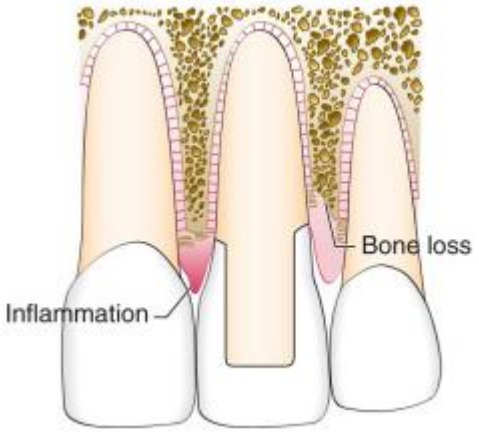

- 2017 World Workshop
- Classification of Periodontal and Peri-Implant Diseases and Conditions
- Workgroup 1

  ~~Biologic Width~~

  Supra-crestal attached tissues

# What happens if it is violated?

- Microbiota shift
- Tissue inflammation
- Attachment and bone loss
- Gingival reccession




- Inflammatory process tries to more apically and re-structure the lost dimmensions

Parma-Benfenati et al 1985

# Violation of the BW (SCAT)

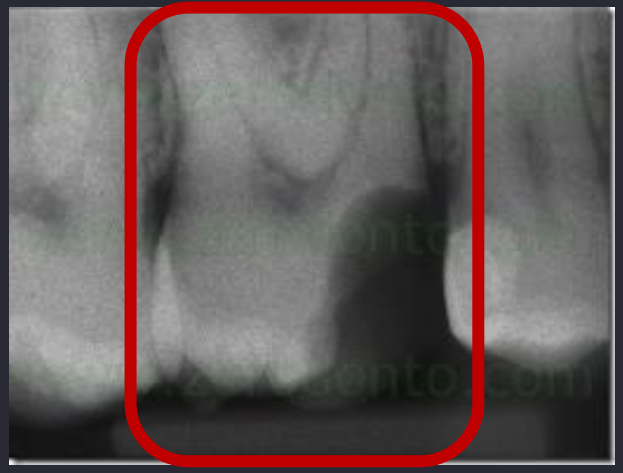
# Location of restorative margins

What determines the location of the margins?

- Extension of damage
- Retention/resistance
- Esthetics

- Subgingival restorative margins have been associated with increased dental plaque accumulation that leads to gingival inflammation and periodontal pocket formations (de Waal & Castellucci, 1994, Schatzle et al. 2001).
- Apart from their effect on inflammatory process, subgingival margins may cause damage to attachment apparatus by violation to the biological width as shown in humans (Tarnow et al. 1986) and animal studies (Tal et al. 1989).
- Experimental studies have shown that supragingival margins should be chosen whenever possible during cavity or crown preparation, and furthermore, that restoration margins already placed subgingivally should be re-exposed by surgical crown lengthening of the clinical crown (Padbury et al., 2003).

# SUPRA-CRESTAL ATTACHED TISSUES-SIGNIFICANCE



# SUPRA-CRESTAL ATTACHED TISSUES- SIGNIFICANCE

Alveolar bone loss, pathological pocket and inflammation



*Gingival inflammation and pathological pocket*

*Bone loss*

# SUPRA-CRESTAL ATTACHED TISSUES-SIGNIFICANCE

Alveolar bone loss  + recession of the FGM

------->Poor aesthetics

# SUPRA-CRESTAL ATTACHED TISSUES- SIGNIFICANCE

- Subgingival restoration
- Plaque accumulation
- Chronic inflammation
- Recurrent caries
- Challenging to take an impression!

# EVIDENCE OF ADVERSE EFFECT OF SUBGINGIVAL RESTORATIONS AND ENCROACHMENT OF SCAT

## ANIMAL STUDIES

### Parma-Benfenati (1986)

- Beagle dogs
- Restorative margins placed at the alveolar crest
- Gingival inflammation and loss of attachment
- Approximately 5 mm of osseous resorption

*International Journal of Periodontics & Restorative Dentistry 6, 65–75*

# EVIDENCE OF ADVERSE EFFECT OF SUBGINGIVAL RESTORATIONS AND ENCROACHMENT OF SCAT

## HUMAN STUDIES

### Broadbent 2006

- Long standing cohort study in New Zealand
- 884 study members.
- Where a caries/restorative event had occurred on an inter-proximal tooth surface, the attachment loss at the corresponding periodontal site was approximately twice more likely to be ≥3 mm than if the adjacent tooth surface had remained sound.

*J Clin Periodontol, 2006, 33(33), 803-10*

# EVIDENCE OF ADVERSE EFFECT OF SUBGINGIVAL RESTORATIONS AND ENCROACHMENT OF SCAT

## HUMAN STUDIES

### Schatzle M, Lang NP 2000

- 26 years longitudinal study!
- Compared periodontal parameters in sites with subgingival margins and supragingival margins.
- Confirmed detrimental effect of subgingival margins to gingival and periodontal health.
- The increased loss of attachment is a slow process and could be detected clinically 1 to 3 years after the fabrication and placement of the restorations.

*J Clin Periodontol 2000; 28: 57–64*

# EVIDENCE OF ADVERSE EFFECT OF SUBGINGIVAL RESTORATIONS AND ENCROACHMENT OF SCAT

## HUMAN STUDIES

### Flores De-Jacoby 1989

- Microbiological study
- Subgingival margins demonstrated increased plaque and gingival scores and probing depths.
- More spirochetes, fusiforms, rods, and filamentous bacteria were found to be associated with subgingival margins.

*Int J Periodontics Restorative Dent. 1989;9:197-05*

- *Always aim for supragingival restorative margins.*

- *In aesthetic zone, it is suggested that restorative margins should not be placed more than 0.5 mm below the gingival tissue (Nevins 1984).*

*The International journal of periodontics & restorative dentistry. 1984;4(3):30-49*

# Location of restorative margins

## SUPRAGINGIVAL LOCATION

Ideal for perio because it is easy to clean and no interference with SACT

But what about aesthetic?? More translucent materials, adhesive dentistry, resin cements, finishing quality allow for supra placement too.

## EQUIGINGIVAL

If **SUBGINGIVAL** margins are required:

- Conservative subgingival extension of margins
- Sufficient width of KT ( at least 2 mm including 1 mm attached gingiva)
- Smooth restorative surfaces with proper finished margins
- Avoid BW breach

- But situations exist when subgingival margins are already present or the crowns are short

Subgingival caries

Fractures

Root resorption

Perfurations

Subgingival marging preparations

Short clinical crowns

Aesthetics

# QUESTION?

Can I just “snip off” the gingiva using a bur, scalpel, laser machine or electro surgery to improve my access?

- The restoration becomes supragingival only temporarily.
- FGM will also grow back and the restoration will then become subgingival
- SCAT space  has still been invaded and the rest. margins are in close proximity to the alveolar bone.

# Treatment options

Surgery +/- osseous recontouring

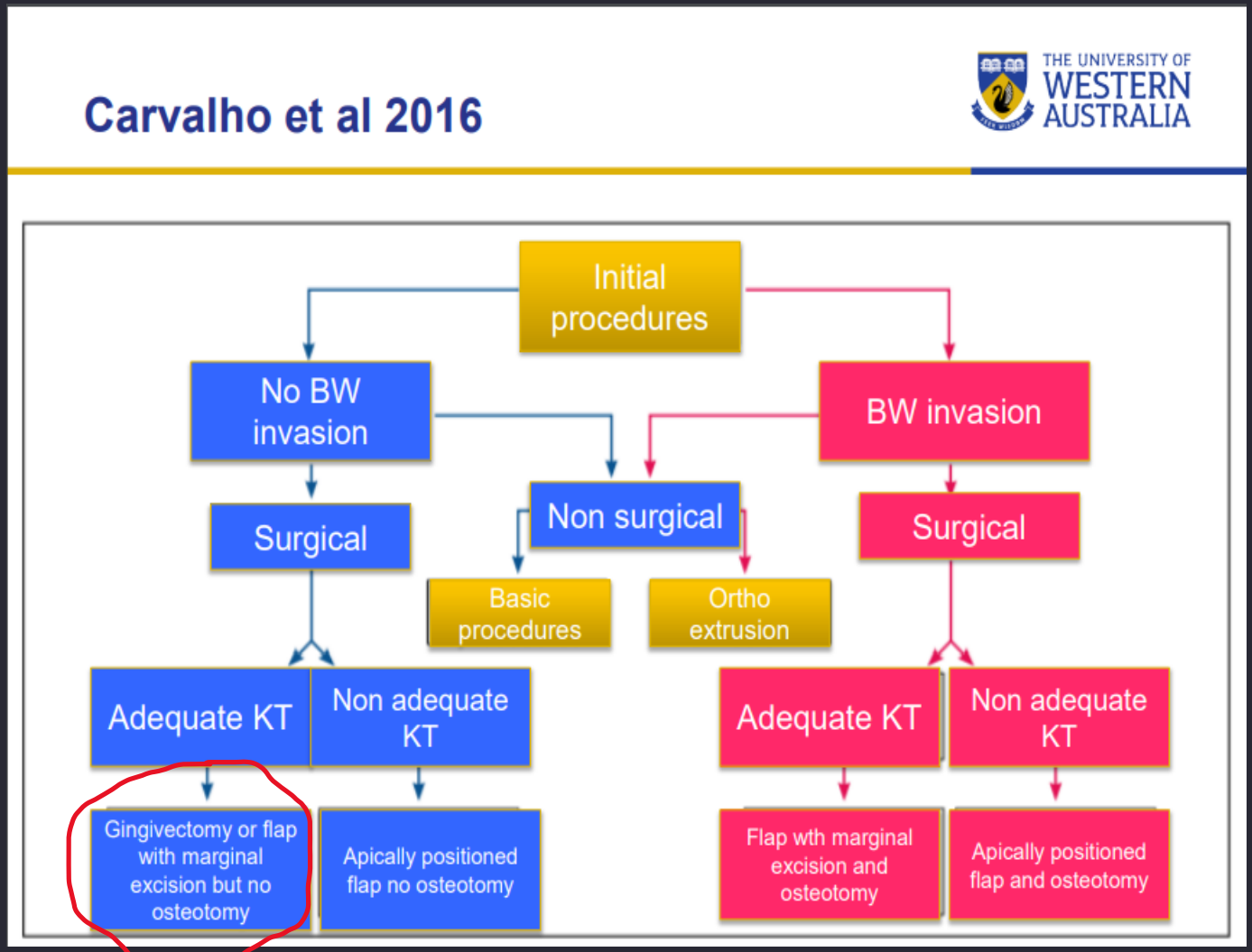
Orthodontic extrusion

Or both

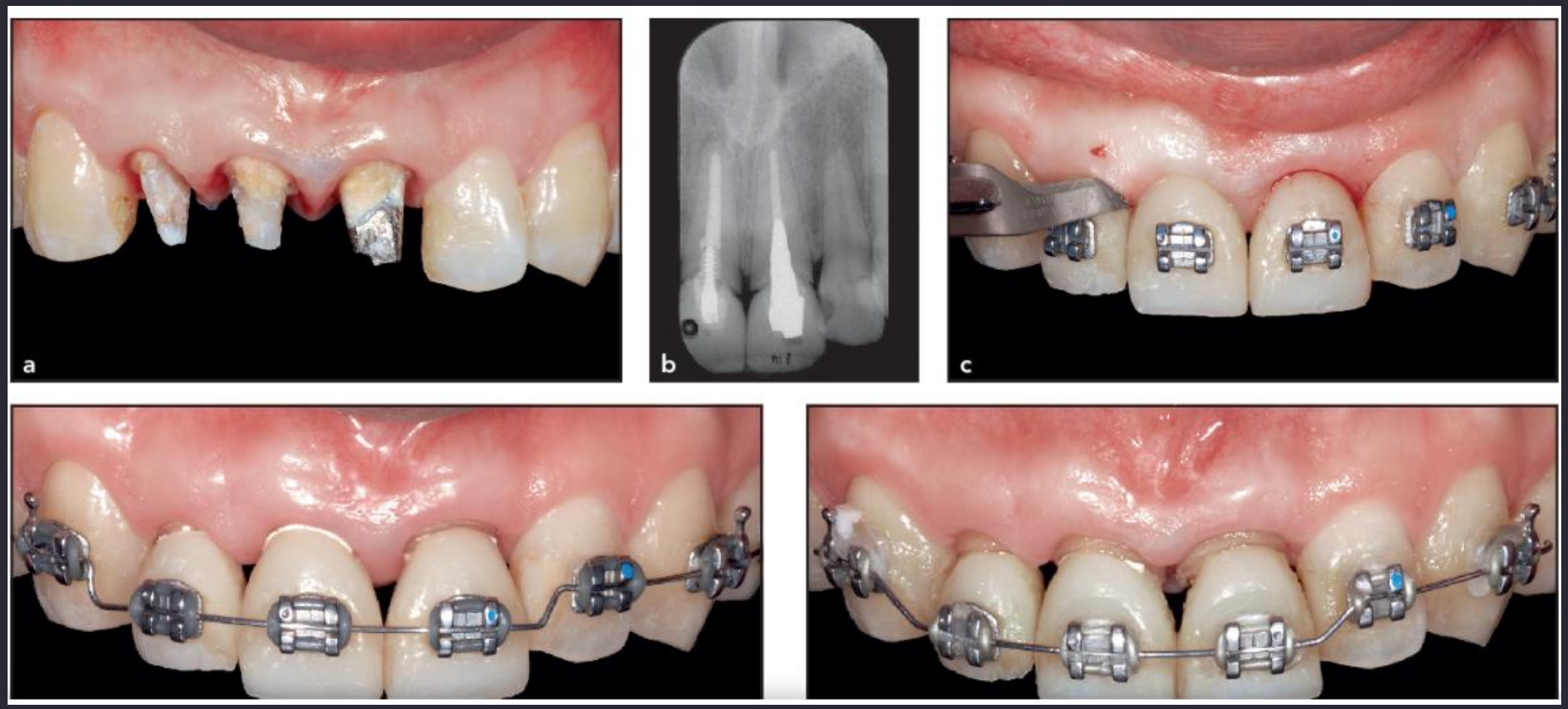
# Managing subgingival margins-the basics

| Establish | Measure | Measure |
| --- | --- | --- |
| Establish the position of final margin<br>( eg after caries removal) and provide provisional restoration if required | Measure margin to bone and supracrestal tissue attachment ( Biological Width) | Measure keratinized tissue width |

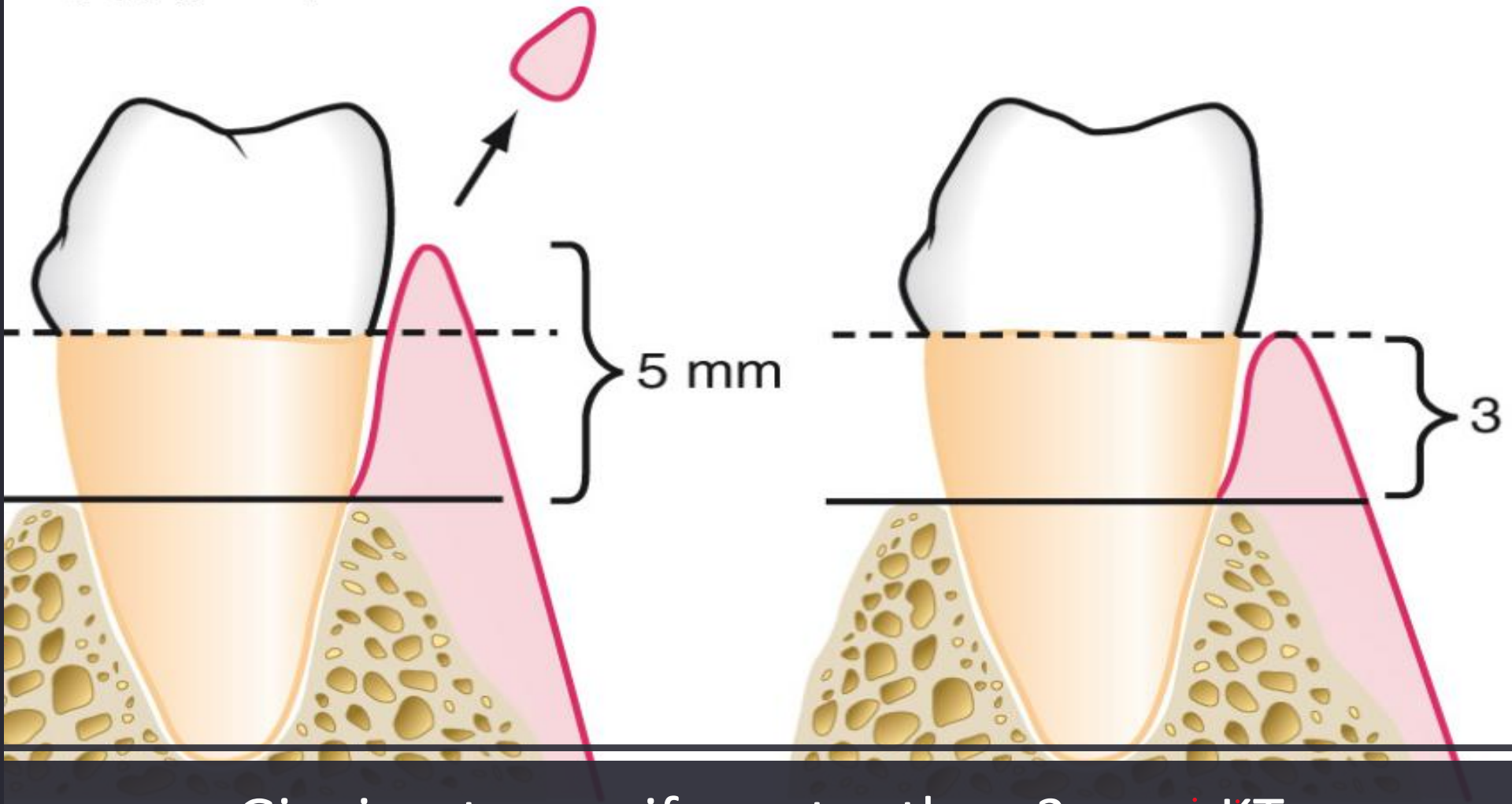
# Guidelines to managing Pros procedure



# Orthodontic extrusion can change the position of the margin from subgingival to supragingival



er than 3 mm of soft tissue between the bone and gingival margin, with adequate attached gingiva, allows cro
nening by gingivectomy.




Gingivectomy –if greater than 3mm +KT

# CROWN LENGTHENING- DEFINITON

*A procedure where the controlled displacement of the alveolar bone, the supra-crestal attached tissues (CT and JE) and FGM is carried out to allow for supragingival placement of restoration with minimum future changes in the surrounding periodontium.*

# CROWN LENGTHENING- DEFINITON

Therefore, *In the early stages of restorative treatment planning, if the clinician believes that the margin of the final restoration will be subgingival and/or in close proximity to alveolar bone crest, crown lengthening should be recommended.*

## Biological Width = Supracrestal tissue attachment

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DIAGNOSIS:

Measuring the BW

- Transgingival/periodontal probing
  - Anaesthesia
- PA radiographs
- CBCT

2 to 3 mm

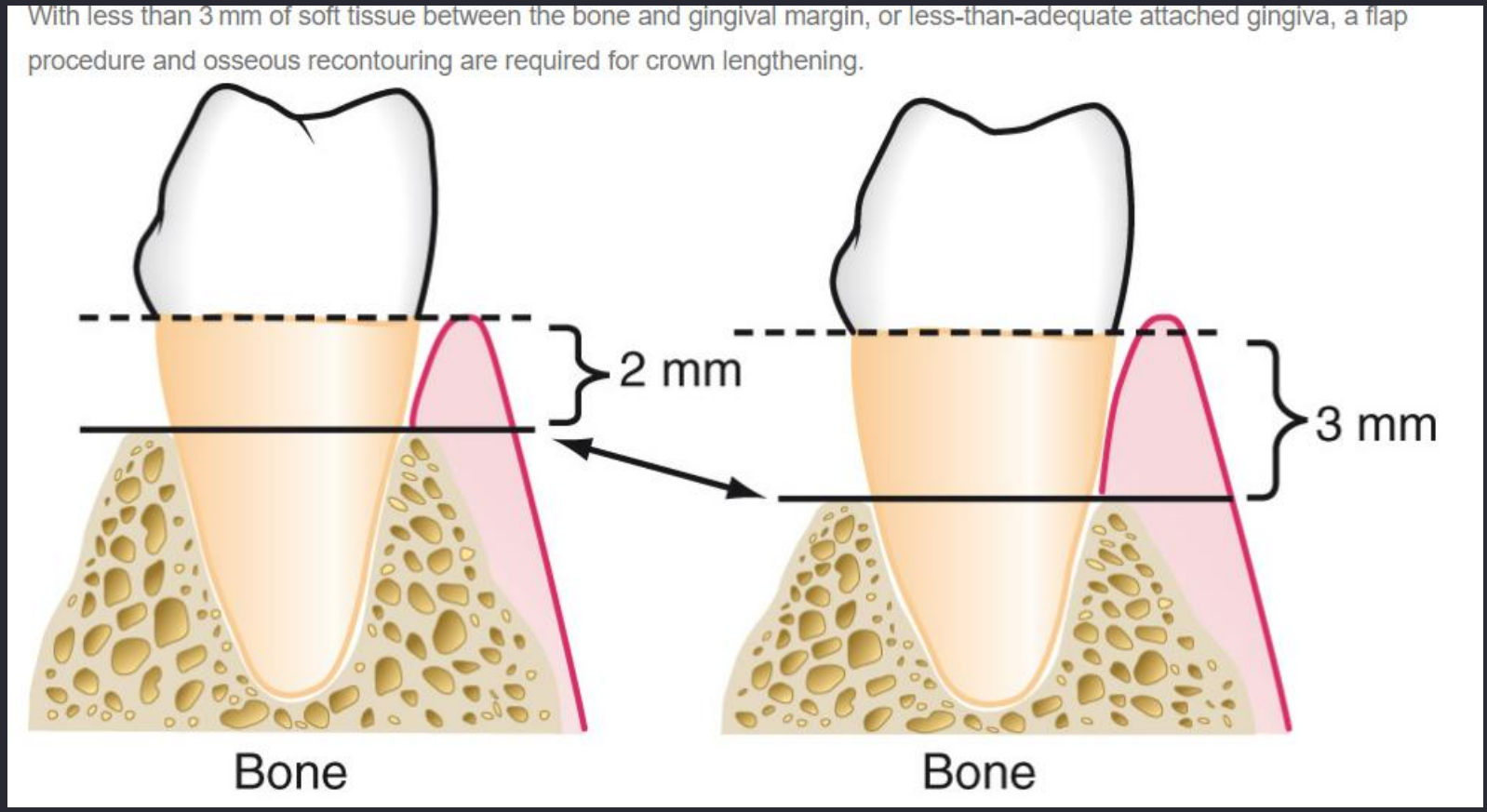

Fig 2 Esquema representativo da identificação da JCE em dente íntegro através da sondagem periodontal. Esta medida clínica corresponde, histologicamente, ao epitélio do sulco e epitélio juncional em condições fisiológicas normais, em média 2 mm.

Fig 3 Avaliação clínica da identificação da JCE em dente íntegro através da sondagem periodontal. Esta medida clínica corresponde, histologicamente, ao epitélio do sulco e epitélio juncional em condições fisiológicas normais, em média 2 mm.


Fig 4 Esquema representativo da identificação da COA em dente íntegro através da sondagem periodontal transgengival. Esta medida clínica corresponde, histologicamente, ao epitélio do sulco, epitélio juncional e inserção conjuntiva em condições fisiológicas normais, em média 3 mm.

Fig 5 Avaliação clínica da identificação da COA em dente íntegro através da sondagem periodontal transgengival. Esta medida clínica corresponde, histologicamente, ao epitélio do sulco, epitélio juncional e inserção conjuntiva em condições fisiológicas normais, em média 3 mm.

# Flap + osseous recontouring=CL



# The importance of keratinised tissue and phenotype

# Aesthetic crown lengthening


a


b


c


d

# Lack of KT & difficulty in cleaning

# CL procedures

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## Surgical

### Soft tissues

- Gingivectomy
- NO BW invasion

### Soft and hard tissues

- Gingivectomy and osteotomy
- BW invasion

**HEALING = minimum 3 months up tp 6 months**

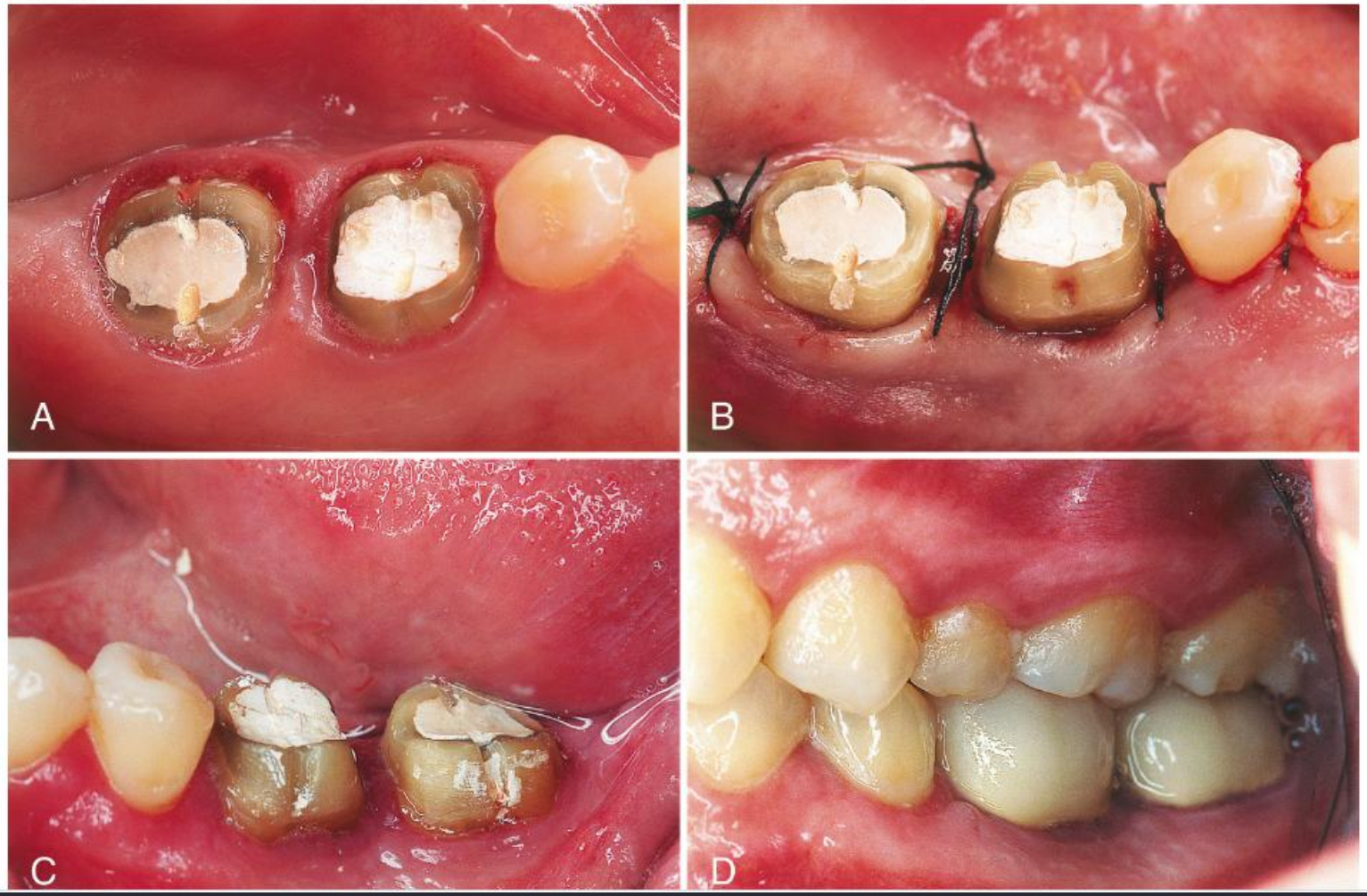
Lanning et al 2003

Pontoriero et al 2001

Bragger et al 1992

## Crown-Lengthening Procedures

Note increased clinical crown. (C) Buccal view after surgery. (D) Final restorations.



# Apically repositioned flap-if insufficient keratinized tissue present

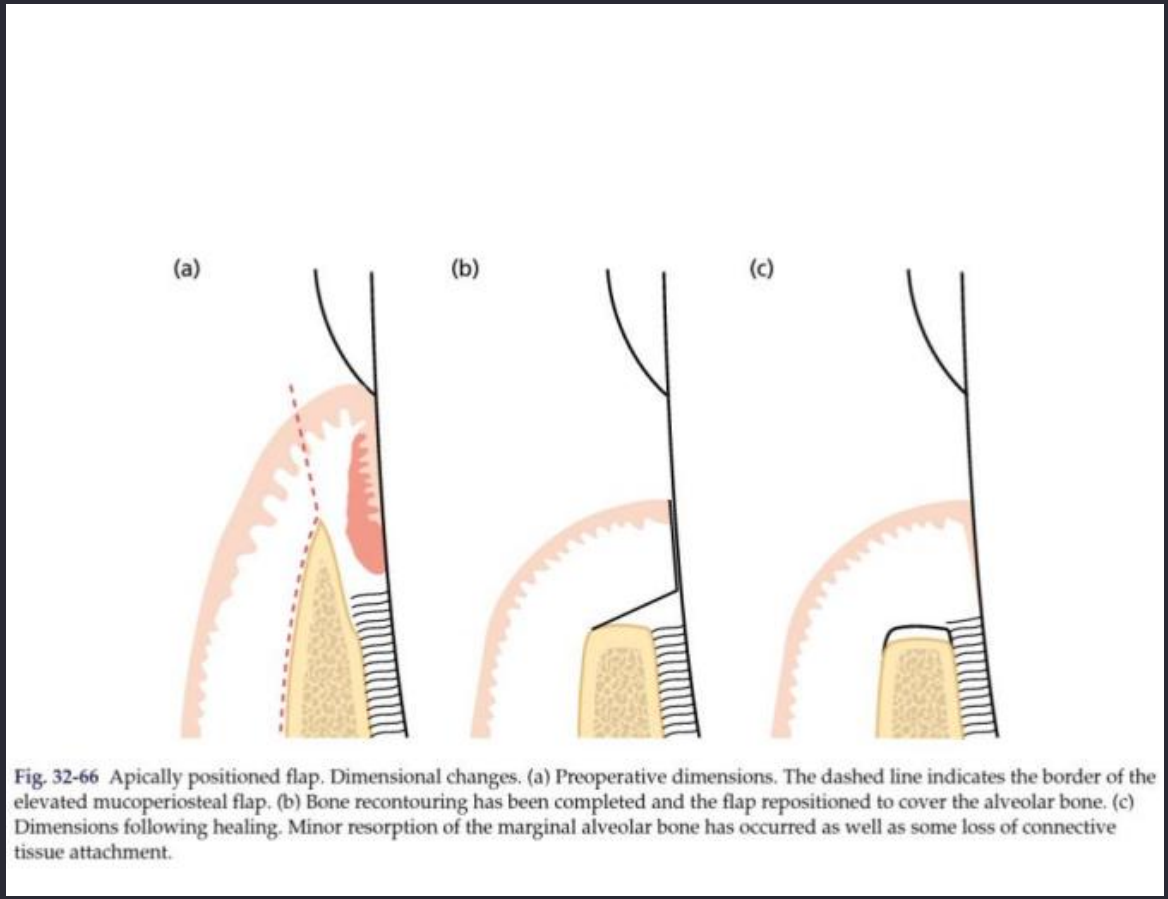



Fig. 32-66 Apically positioned flap. Dimensional changes. (a) Preoperative dimensions. The dashed line indicates the border of the elevated mucoperiosteal flap. (b) Bone recontouring has been completed and the flap repositioned to cover the alveolar bone. (c) Dimensions following healing. Minor resorption of the marginal alveolar bone has occurred as well as some loss of connective tissue attachment.

# Marginal fit

Poorly adapted restorations clearly have been implicated in producing an inflammatory response in the periodontium.

Open margins (several tenths of a millimetre) are capable of harbouring large numbers of bacteria.

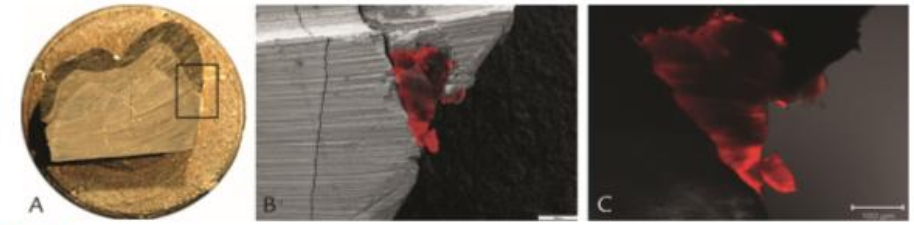



**Figure 1.** A, Microscopic image (cross-sectional view) at buccal margin. B, Confocal laser scanning microscopy (CLSM) in combination with scanning electron microscopy (SEM). C, CLSM alone demonstrating presence and formation of biofilm (red area).

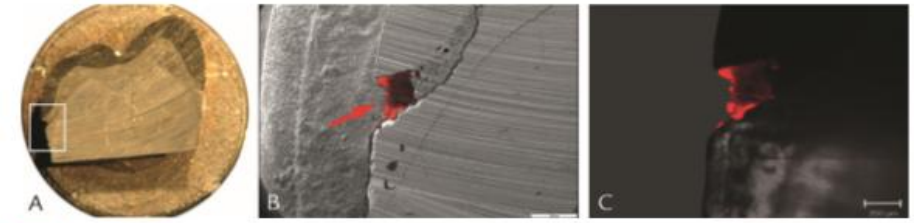



**Figure 2.** A, Microscopic image (cross-sectional view) at lingual margin. B, Confocal laser scanning microscopy (CLSM) in combination with scanning electron microscopy. C, CLSM alone demonstrating presence and formation of biofilm (red area).

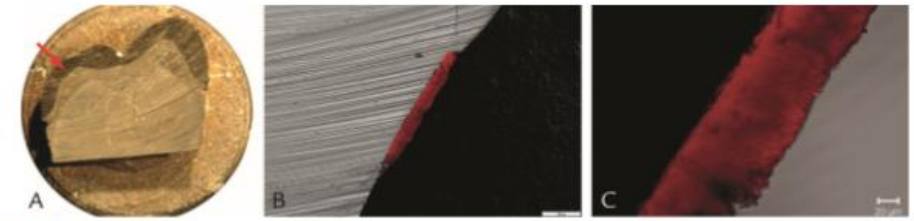



**Figure 3.** A, Cross-sectional view of interface between restoration and tooth structure at occlusal surface of tooth. B, Confocal laser scanning microscopy (CLSM) in combination with scanning electron microscopy. C, CLSM alone confirming formation of biofilm in area with low accessibility to nutrients and oxygen.

THE JOURNAL OF PROSTHETIC DENTISTRY

CLINICAL REPORT

Biofilms in restorative dentistry: A clinical report

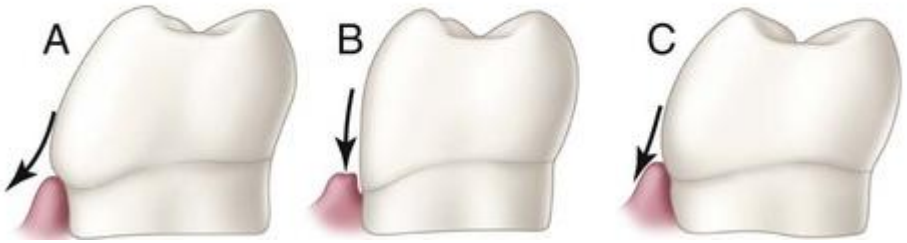
Vincent Torresyap, DDS,[a] Alireza Moshaverinia, DDS, MS, PhD,[b] and Winston W. Chee, DDS[c]

# Contours

Ideally: crown contours should provide protection of gingival margins, allow cleansing action of the musculature and facilitate access to oral hygiene

Overcontour has negative effects on the periodontium due to plaque accumulation as well;

Try to overcome this with adequate crown reduction for the type of material to be used.



# Restorative materials – surface finish

Every finished surface of restorative materials has different capacity for retaining plaque (Bollen et al. 1997, Ababnaeh et al., 2011).

Surface characteristic of restorative materials - surface roughness and surface free energy inherent in the materials.

The rough surface of restorative materials especially on the interproximal and marginal can become predisposing factors for plaque accumulation and lead to destruction of periodontium (Pneumas et al. 1998, van Dijken et al. 1987). These studies found that, finishing on the interproximal of composite resins were difficult to achieve and marginal defect frequently detected; resulting of highly bacterial plaque accumulation.

Highly glazed porcelain is less plaque retentive than enamel, whereas on the other hand, metal pontic or composite restoration tends to encourage plaque formation (Wise & Dykema 1975).

# To finalize …

For restorations to survive long term, the periodontium must remain healthy so that the teeth are maintained.

For the periodontium to remain healthy, restorations must be critically managed in several areas so that they are in harmony with their surrounding periodontal tissues.

# Thank you!!!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# Reading Resources

DOI: 10.1002/JPER.16-0569

2017 WORLD WORKSHOP

JOURNAL OF Periodontology

## Dental prostheses and tooth-related factors

Carlo Ercoli[1] | Jack G. Caton[2]

Periodontology 2000, Vol. 74, 2017, 40–62



PERIODONTOLOGY 2000

et_al-2017-Periodontology_2000.pdf

Periodontology 2000

## Interdisciplinary interface between fixed prosthodontics and periodontics

Jaafar Abduo & Karl M. Lyons

Periodontology 2000, Vol. 74, 2017, 74–101



PERIODONTOLOGY 2000

Periodontology 2000

## The periodontal restorative interface: esthetic considerations

Vincent Bennani, Hadeel Ibrahim, Latfiya Al-Harthi & Karl M. Lyons