Core build-up using post systems

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What to speak about today

- General considerations
- Classification of post systems
- Dowel-core or fibre post?
- Biologic width
- Crown lengthening methods

General considerations

At the beginning…

- Decide if the given tooth can ce kept or extracted
- When starting a root canal treatment one should know what will be the definitive treatment of the actual tooth
- Evaluate the degree of destruction
- Direction of the forces pointing to the given tooth
- Decide what kind of crown should be done
- Evaluate the position of the gingival margin of the restoration regarding the periodontal tissues

Requirements for restoration of a root canal treated tooth

- Proper coronal seal for the root canal filling
  - Prevent the infection by bacteria from the oral cavity
- Protect remaining tooth structure
  - Avoid fracture
  - Prevent recurrent caries
- Functional restoration – Restore original chewing ability
- Esthetics – Especially important on front teeth

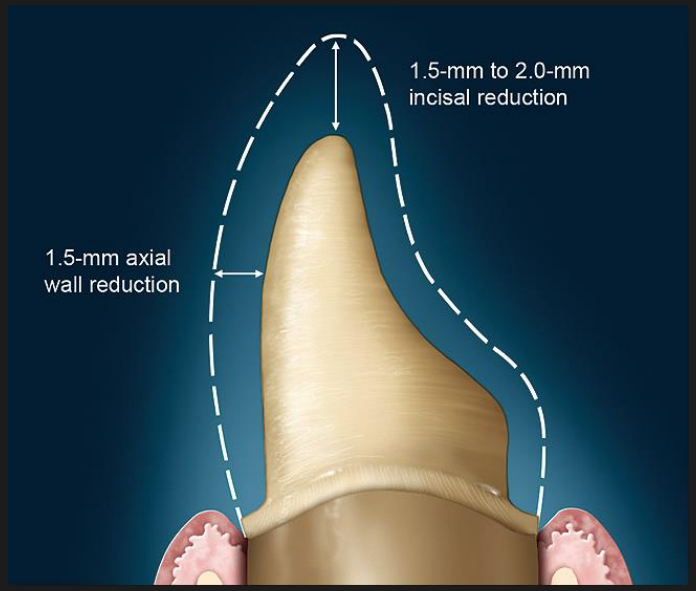
Design of restoration

- Evaluate the degree of destruction
  - Direct or indirect restoration
  - Intracoronal restoration or crown
  - Using the root canal space for additional retention
    - post systems
  - Position of the gingival margin of the restoration
    - crown lenghtening methods

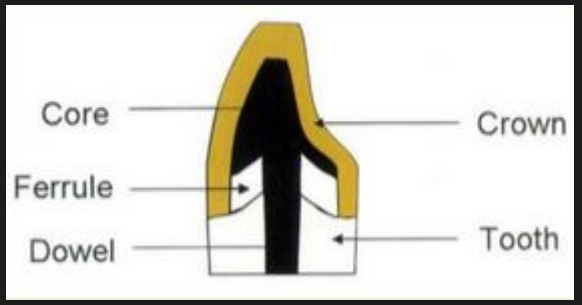
Tooth preparation

- Principles of tooth preparation according to Schillingburg:

- Preservation of tooth structure
- Retention and resistance
- Structural durability
- Marginal integrity
- Preservation of the periodontium



Ferrule effect



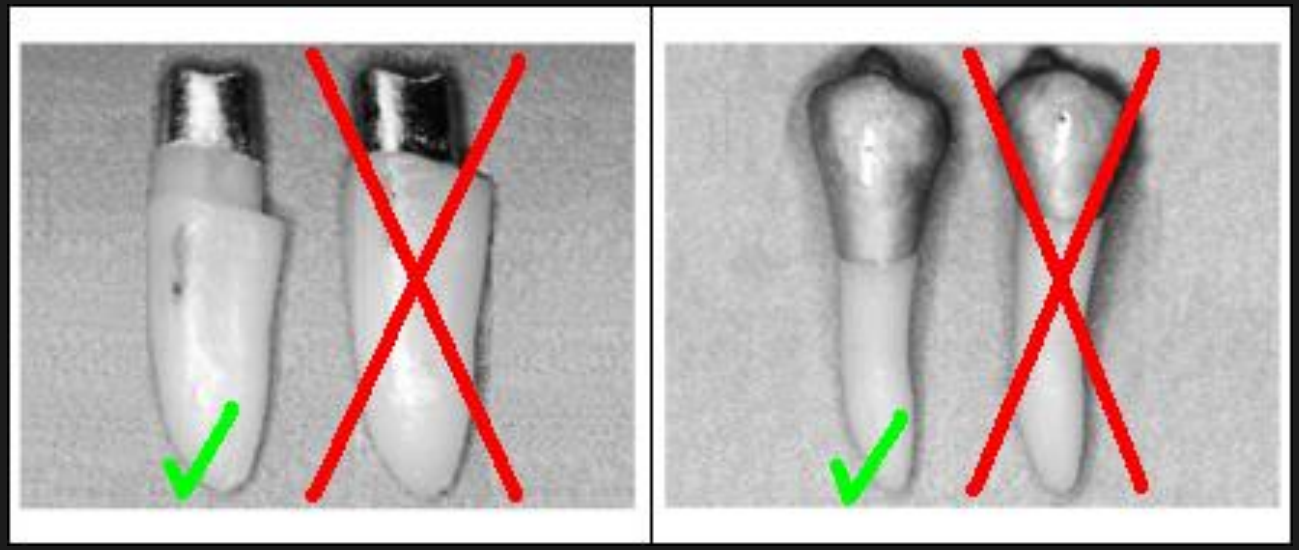
- Retention and resistance

- Minimal height of the prepared tooth should be at least 4mm
  - Possible extension:
    - Coronal direction – core buildup fixed in the root canal space
    - Apical direction – crown lengthening

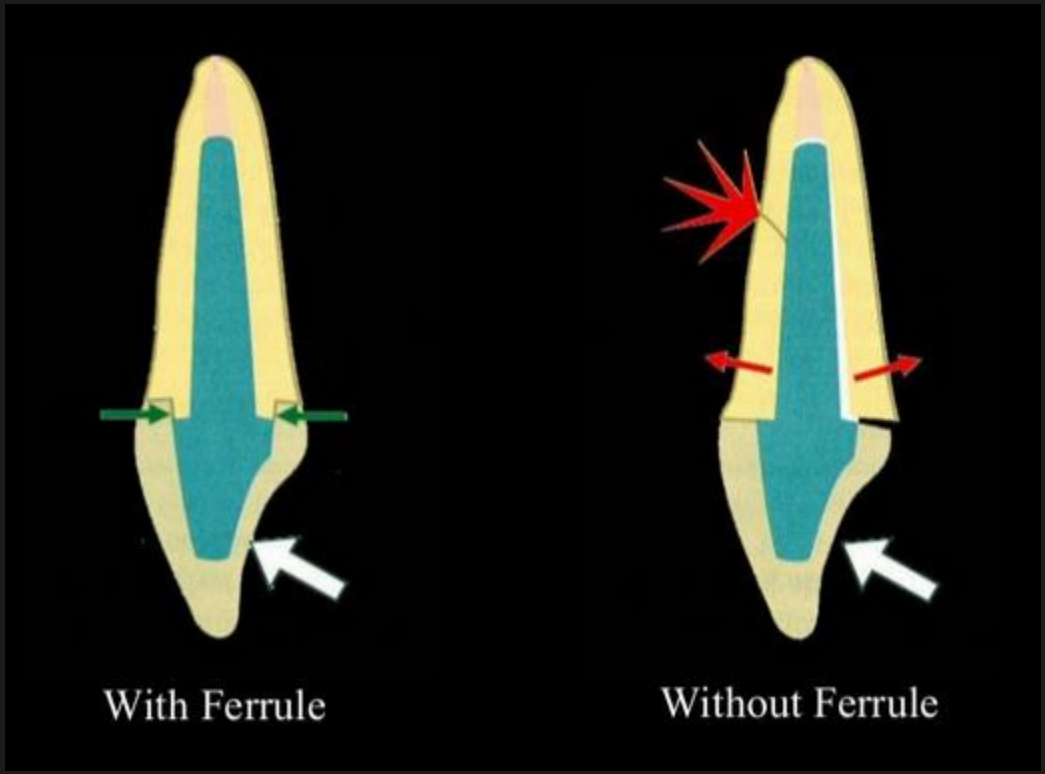
- Axial walls should show 6-10 degree convergency to coronal direction

- The crown should surround at least 2mm tooth structure towards apical direction from the margin of the dowel core or core buildup!!!

Ferrule effect



Ferrule effect



Classification of post systems

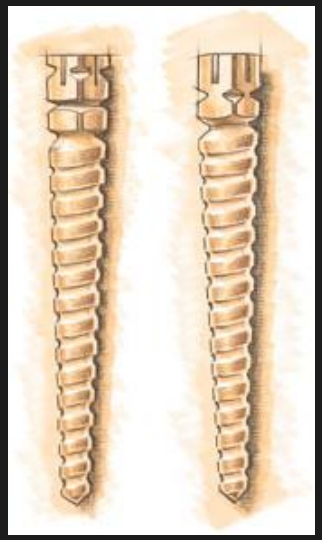
Classification of post systems

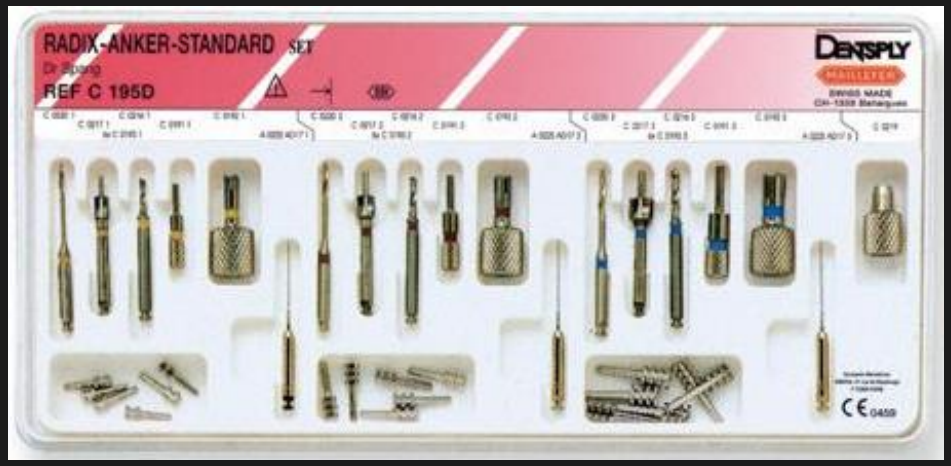
- Post systems
  - Custom made
    - Dowel-core
      - Metal
      - Ceramic
  - Prefabricated
    - Fibre posts (bonded to tooth with composite type material)
      - Glass fibre/carbon fibre
        - » Tapered
        - » Non tapered
    - Metal (luted to tooth with glass ionomer/phosphate cement)
      - Screw type
      - Passive


CARBONITE
CARBON FIBRE POST
NO2
SWISS MADE
NORDIN


GLASSIX
GLASS FIBRE POST
NORDIN


Ø 1.20
Ø 1.35
Ø 1.50
GLASSIX RADIOPAQUE
NORDIN

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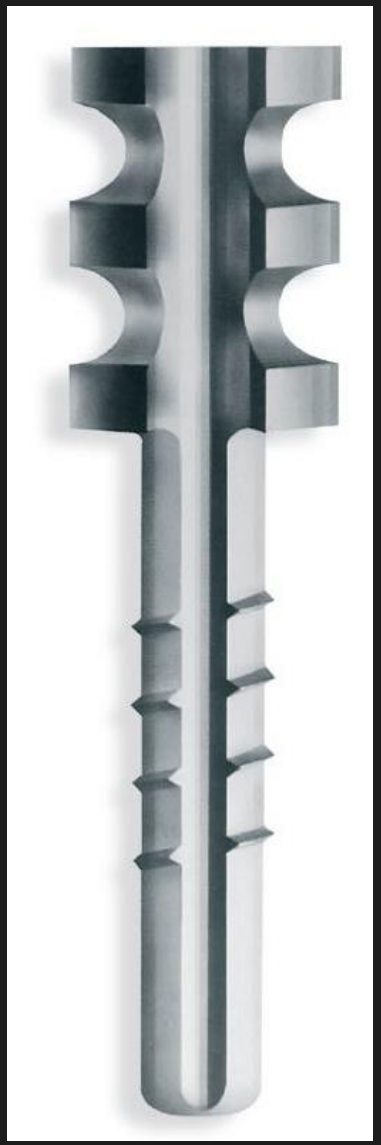


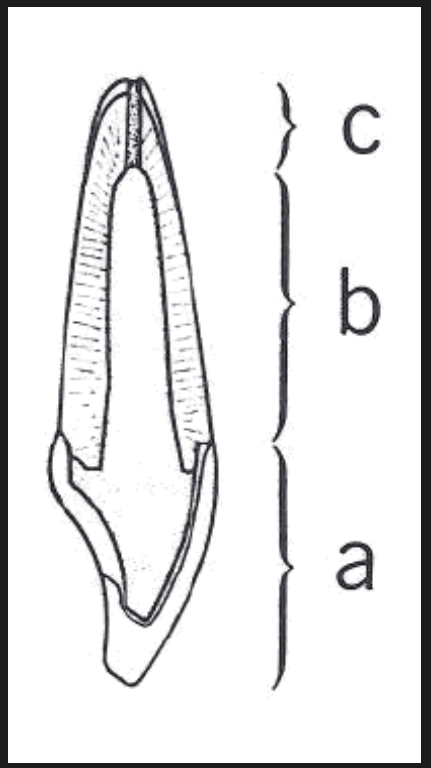
Evaluation of prefabricated metal posts

- Advantage:
  - Can be done at one appointment → lower risk of contamination of the root canal filling
  - No laboratory cost
- Axial walls
  - Tapered → can act like a wedge during axial loading, weaker retention
  - Parallel → better retention, risk of fracture at the apical part of the root
- Screw threads
  - Provide superb retention
  - Stress can be created inside the canal walls

Dowel-core

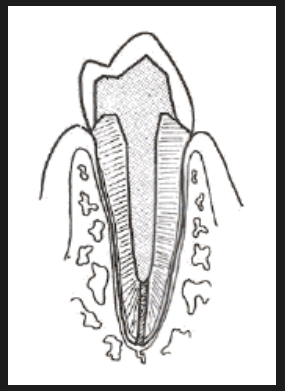
Dowel-core preparation

- The length of the dowel (b):
  - From two-thirds to three quarters the length of the root
  - The minimum length is the length of the crown (a)
  - While at least 4mm of the root canal filling should be remained at the end of the canal (c)
- The diameter of the dowel:
  - One-third the diameter of the root
- Coronal part:
  - Unsupported tooth structure is removed
  - Ferrule effect: the crown should surround at least 2mm tooth structure towards apical direction from the margin of the dowel-core



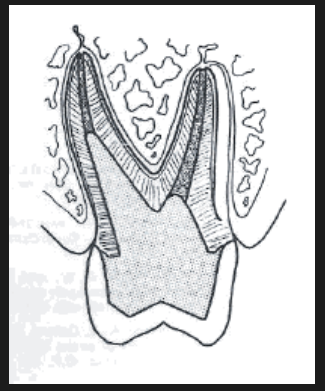
Dowel-core preparation

In teeth with one root canal

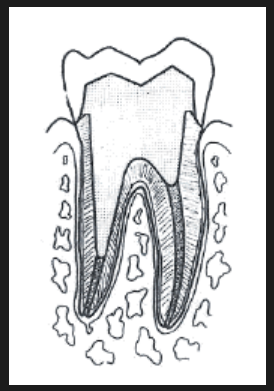


In maxillary premolars

In maxillary molars



In mandibular molars



Dowel-core preparation

- Steps of the preparation:

- Removal of decayed or friable tooth structure on the coronal part of the tooth (reference point!)
- Preparing the root canal space for the post
  - Removing the coronal part of the root canal filling
  - Predrilling the canal walls
- Placing retraction cord
- Preparing shoulder
- Taking impression (silicone – two phase at the same time)

Fibre posts

Preparation for a fibre post

- Steps of preparation:

- Placement of isolation
- Removal of decayed or friable tooth structure on the coronal part of the tooth (reference point!)
- Preparing the root canal space for the post
  - Removing the coronal part of the root canal filling
  - Predrilling the canal walls for the chosen post
- Preparing the tooth structure according the chosen adhesive system
- Fixing the post inside the canal using dual curing cement
- Build up the coronal part of the tooth using composite material
- Removal of isolation
- Preparing shoulder

Preparation for a fibre post

- Different preparation technique comparing to a dowel-core:

- 11mm height of axial canal walls provide proper retention for the fibre post

Dowel-core or fibre post?

Dowel-core or fibre post?

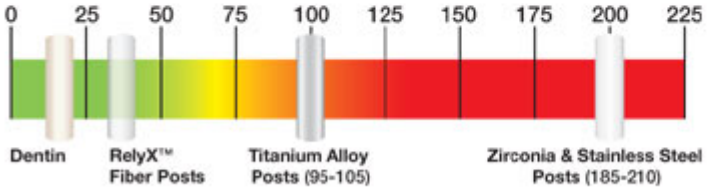
- Consideration:
  - Elasticity
  - Bending forces or axial load?
  - Colour
    - When making full ceramic crowns dowel core made of ceramic or composite core build-up with glass fiber post should be chosen
  - Noumber of root canals involved
    - When placing fiber posts retention can easily be enhanced by involving multiple canals

Elasticity

Why switch from metal to fiber posts?

Clinical research, noted in the graph below, verifies how much more similar the elasticity of RelyX™ Fiber Post is to human dentin than is the elasticity of metal and ceramic posts – which means a much lower risk of root fracture due to the "wedge effect." If endodontic retreatment is required, it's reassuring to know RelyX Fiber Posts can be removed easily, without damaging the tooth.

Elasticity Modulus of Dentin and Post Materials



[Source: 3M internal data and Materials Sicence and Eginnering: An Introduction, 8th Ed., Wiley]

Bending forces or axial load?

- Forces from different direction – different requirements

- Anterior teeth: forces from lateral direction
- Premolars and molars: forces along the axis of the tooth

Biologic width

Biologic width

- Biologic width: vertical dimension of supraalveolar soft tissues
- (First article: *Sicher H.*, 1959)

1,07mm connective tissue attachment

0,97mm epithelial attachment

Biologic width

- Importancy:
  - Placing restorative margin within the biologic width leads to inflammation of superficial and deeper periodontal tissues (gingivitis, periodontitis)
  - Clinically:
    - Gingival inflammation
    - Clinical Attachment Loss
    - Bone loss

Biologic width

- Body's response when violating the biologic width:
  - Recreating the space between the alveolar bone and the margin of the restoration to allow space for the tissue attachment
  - This space is created apically than original position
  - Bone resorption will occur in an uncontrolled process
  - Clinical attachment loss and periodontal pocket will maintain a chronic inflammation
  - Other (accepted) theory: not the direct physical harm will lead to attachment loss but the advanced plaque retention causes the inflammation of the periodontal tissues

Biologic width

- Reaction when violating biologic width:

- Thin biotype gingiva
  → recession
- Thick and fibrotic gingiva
  → scar tissue and deep pocket development

Biologic width

- What to do?
  - Violation of biologic width should be avoided

    → preparation technique

  - If restoration is present that violate the biologic width
  - If caries penetrated too close to the alveolar bone

    → crown lengthening

Biologic width

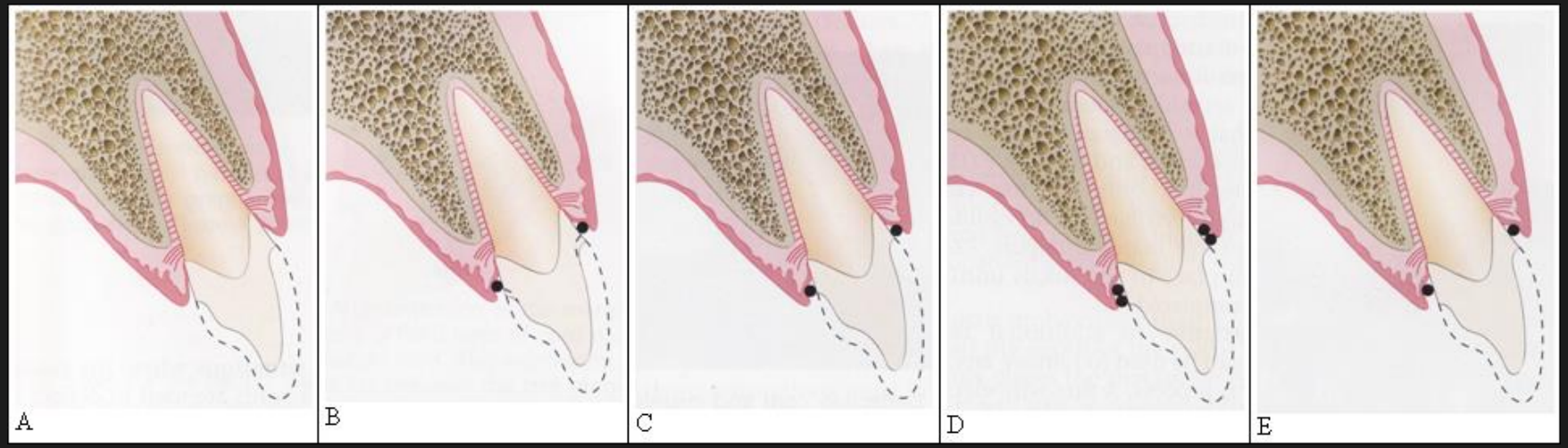
- Preparation technique:

- Supra- or equigingival crown margin
  - easier and least traumatic preparation
  - impressions are easily made
  - restorations can be easily evaluated and cleaned

- Subgingival crown margin
  - According the probing depth of the sulcus:
    type 1: sulcus is no deeper than 1,5mm
    → preparation line should be 0,5mm deeper than gingival line
    type 2: sulcus depth is between 1,5mm and 2mm
    → gingival margin should be at the middle line of the sulcus
    type 3: sulcus is deeper than 2mm
    → should be converted to type2 using gingivectomy

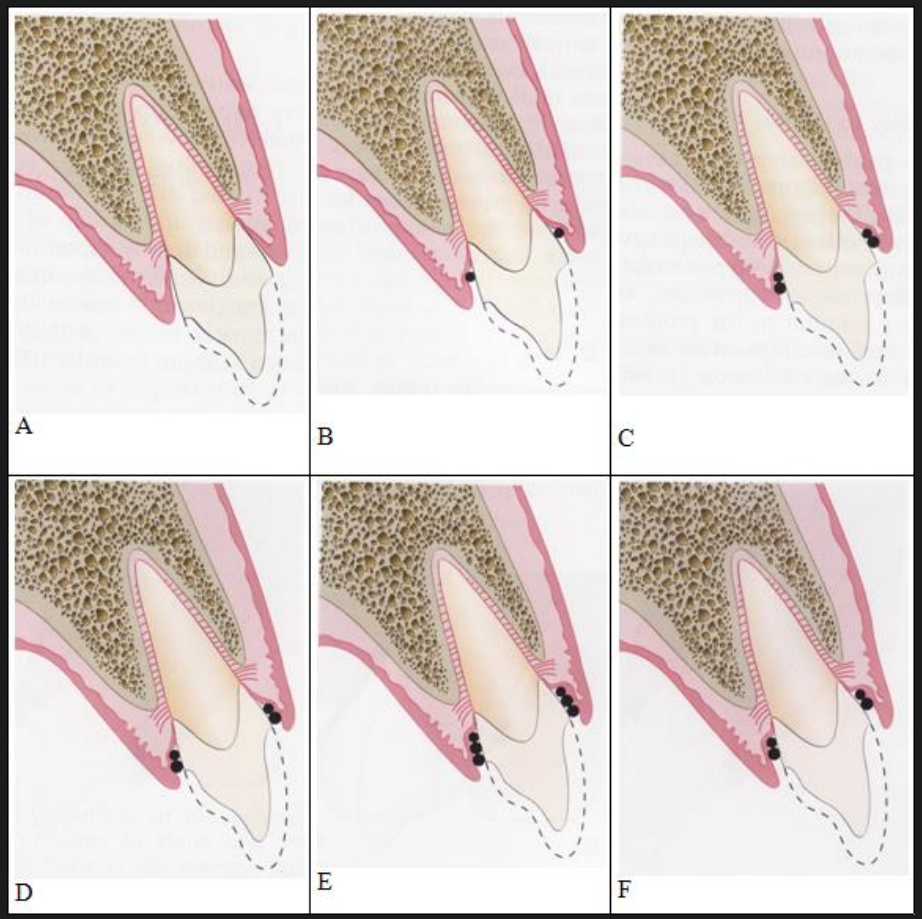
Biologic width

- Preparing subgingival crown margins in case of type1



Biologic width

- Preparing subgingival crown margins in case of type2



Crown lenghtening methods

Crown lenghtening methods

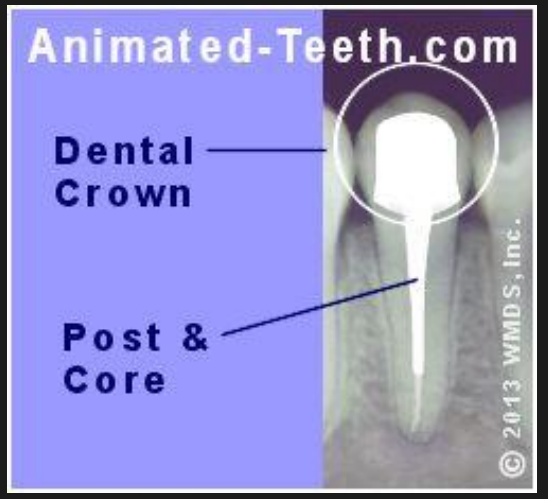
- The aim: at least 2,5-3mm should be held between the alveolar bone and the margin of the restoration

Crown lenghtening methods

- Surgical crown lenghtening
- Orthodontic extrusion

„Take home messages”

- Apico-coronal dimensions:



- At least 4mm root canal filling
- Dowel length: From two-thirds to three quarters the length of the root
- Fibre posts are not neccessary to be placed deeper than 11mm inside the canal
- Biologic width
  - 1.07mm connective tissue attachment
  - 0.97mm epithelial attachment
  - At least 0.5-1mm sulcus
- Ferrule height
  - 2mm
- Prepared tooth should be at least 4mm in height

Thank you for your kind attention!