POSTS: AN INTRODUCTION

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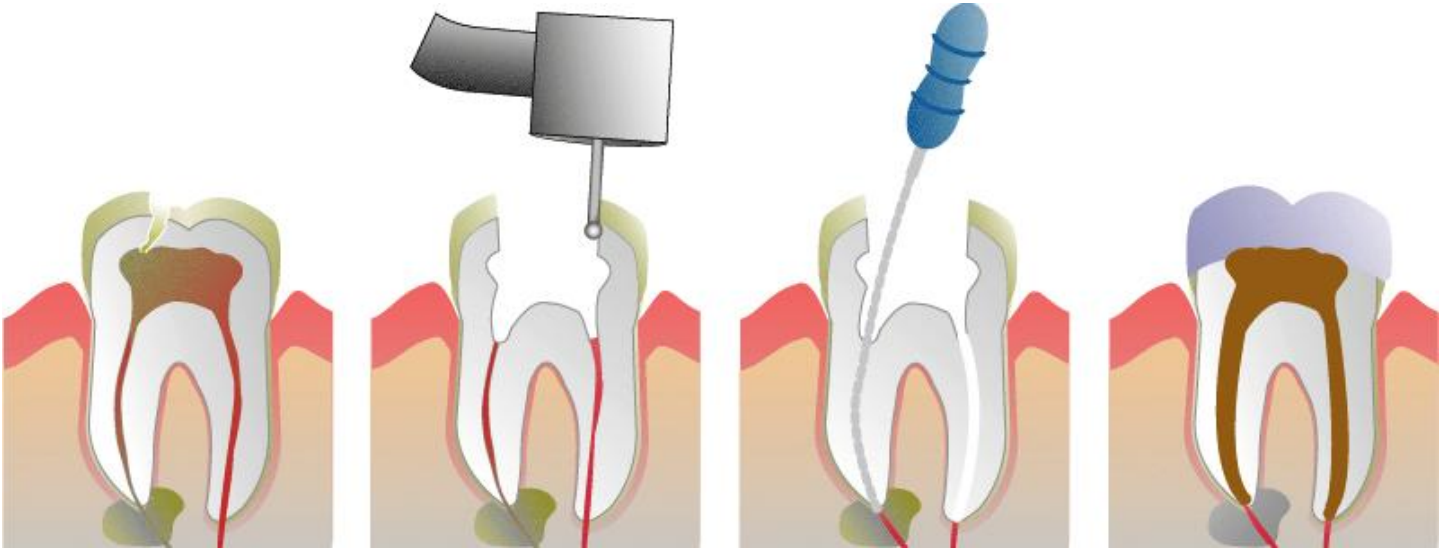
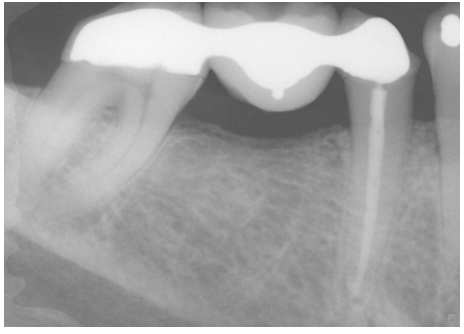
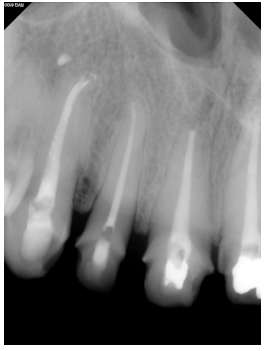
Restoring Endodontically Treated Teeth







General Considerations

- **Are endodontically treated teeth more brittle?**

Classic studies suggested yes:

- Initially attributed to loss of water and loss of collagen cross linking

General Considerations

- **Are endodontically treated teeth more brittle?**

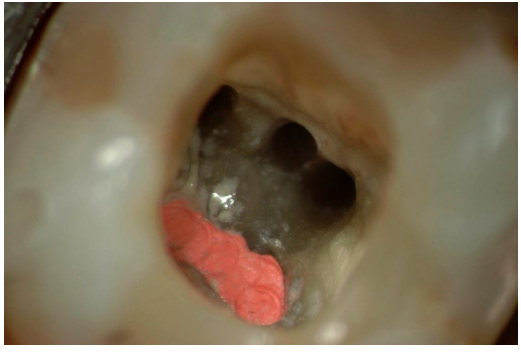
Later studies gave a different perspective…:

  - **Neither dehydration nor endodontic treatment causes degradation of the physical or mechanical properties of dentin**

General Considerations

- **Are endodontically treated teeth more brittle?**

1. **Loss of structural integrity** (associated with access preparation) leads to a higher occurrence of fractures in endo treated teeth



General Considerations

- **Are endodontically treated teeth more brittle?**

2. **Loss of sensory feedback mechanism**

= patients may bite down harder on those teeth

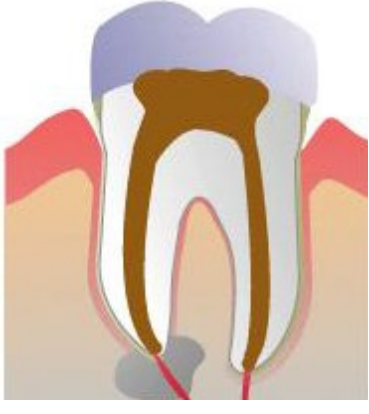
=more frequent fractures

Restoring Endodontically Treated Teeth

Full coverage restorations are frequently recommended **for posterior teeth, due to large amount of missing tooth structure following RCT**

- Better protection from fractures

WHEN YOU PLACE A CROWN



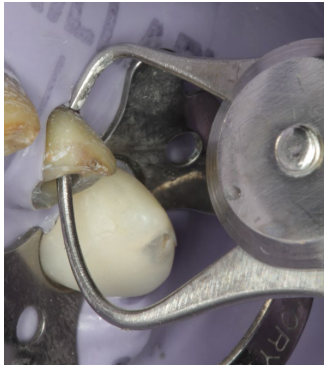
Restorative Checklist – PRIOR TO ENDO

1. **Presence of ferrule circumferentially**
   - How much? Where? E.g. no ferrule on L on mx canine — prob bc that is the tension wall

2. **Crown preparation (and final restoration) must not violate biologic width**
   - Is crown lengthening/ortho extrusion needed? Is it feasible?

3. **Visualize required reduction during tooth preparation**
   - How will the core be retained after the tooth is prepared?

Ninja access - very small. Does not need cc



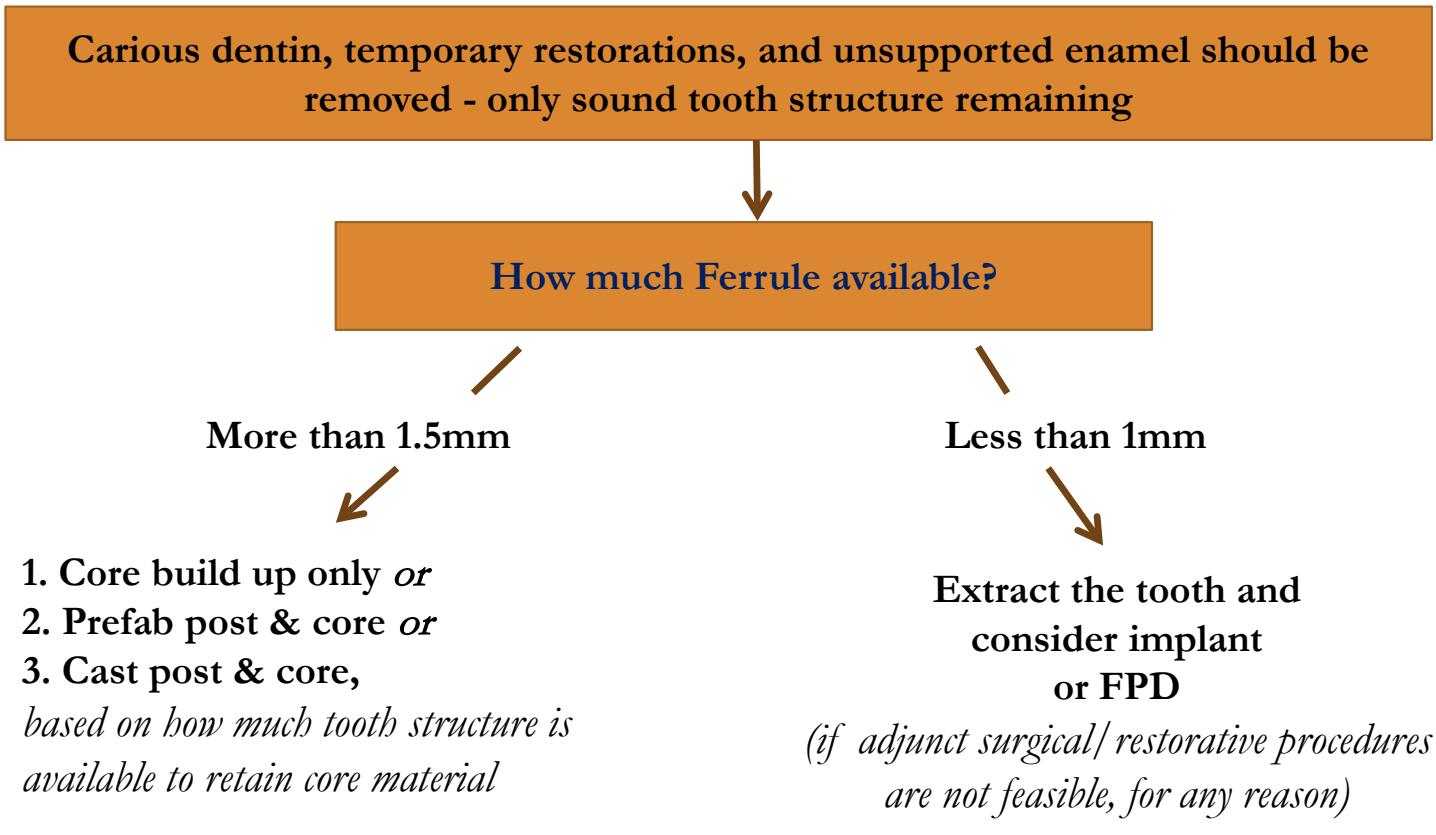
Coronal Tooth Structure

Better prognosis on top bc bottom lost more structure

- The most important part of the restored tooth is **the tooth itself**
  - No combination of restorative materials can substitute for tooth structure
  - The more tooth structure that remains above the marginal gingiva (remember ferrule!), the better the prognosis

RESTORABILITY FLOWCHART

Bowles et al, 2010



The "put it back together" flowchart

Bowles et al, 2010

2-3 walls of tooth structure are present

↓

Core build-up only (amalgam or composite)

1-2 walls of tooth structure are present

↓

Prefabricated post and build-up (amalgam or composite)

M abutment - 1 wall on M only. Needs increased retention such as post

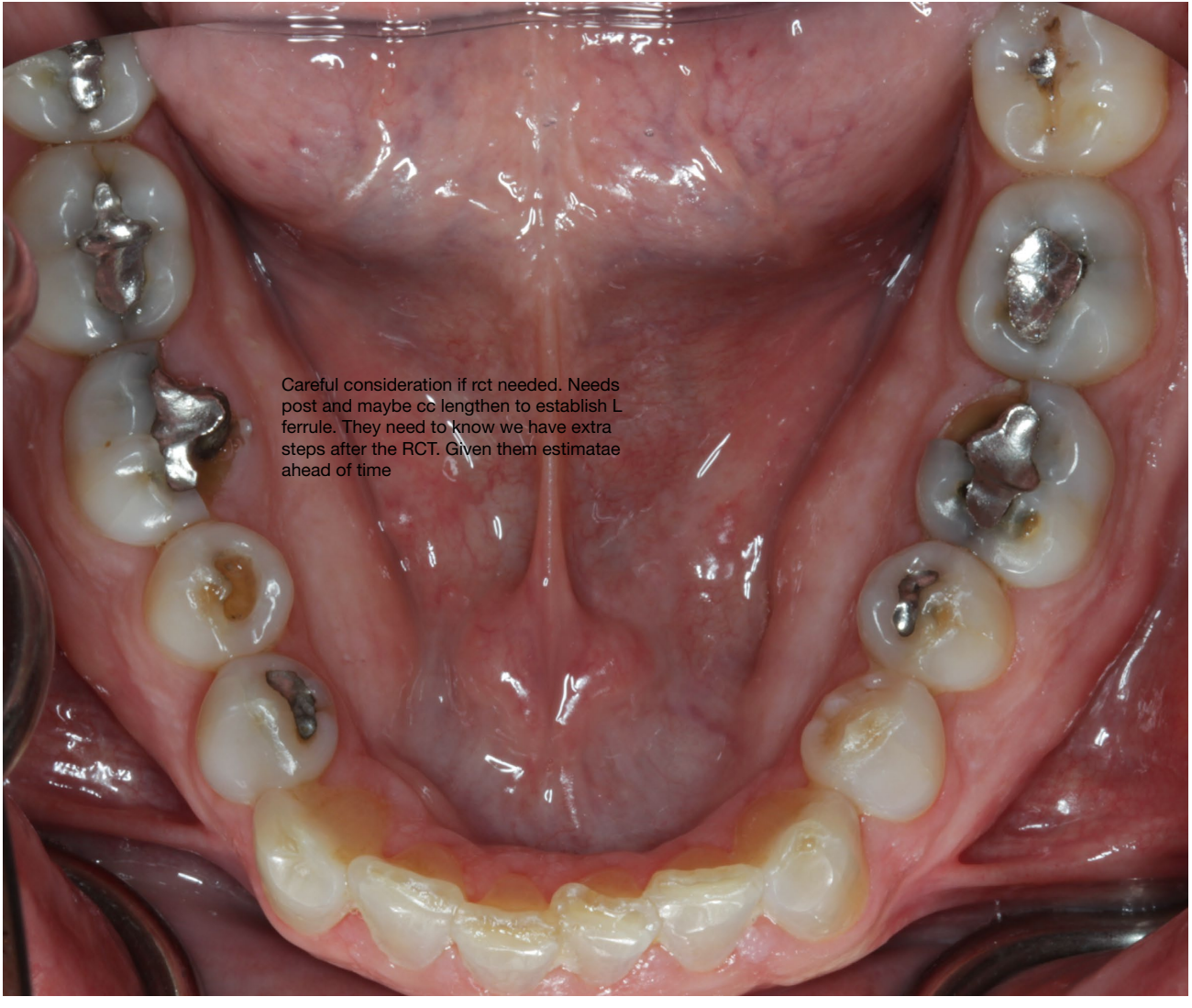
0-1 wall of tooth structure remains

↓

Cast post and core

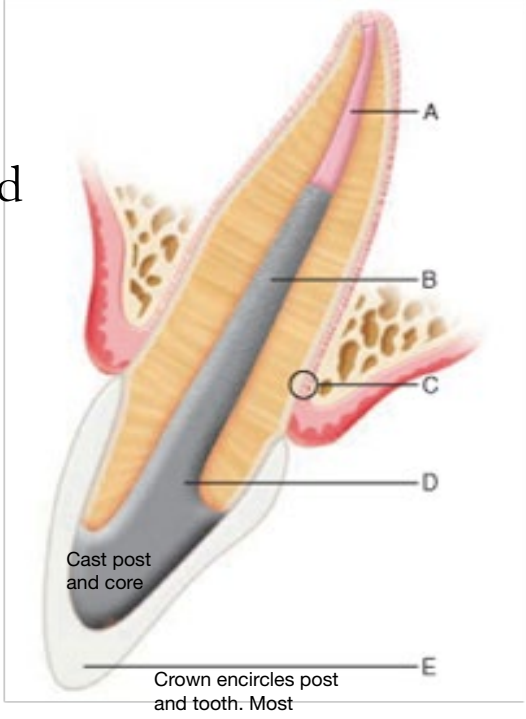
For more severe cases w nothing left


Restorable. Rct. Depending on tooth
structure left, decide definitive restoration. Cc
good option


Careful consideration if rct needed. Needs post and maybe cc lengthen to establish L ferrule. They need to know we have extra steps after the RCT. Given them estimatae ahead of time

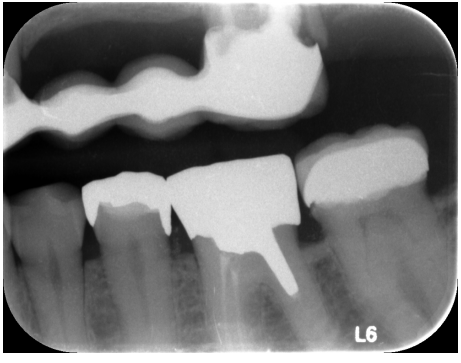
Parts of a tooth with a post

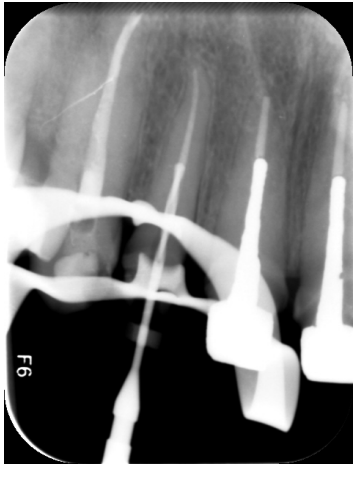
- **Residual coronal and radicular tooth structure** (C)
- RCT filling (A)
- The post, located in the root, which retains the core (B)
- The core, located in the pulp chamber and the coronal tooth structure, which retains the crown (D)
- The coronal restoration, which protects the tooth and restores function and esthetics (E)
- The adhesive bonding agents which joins the components (post to tooth, crown to core)

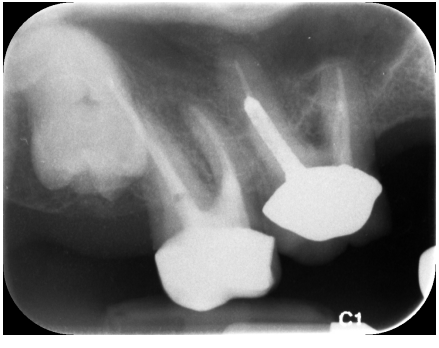


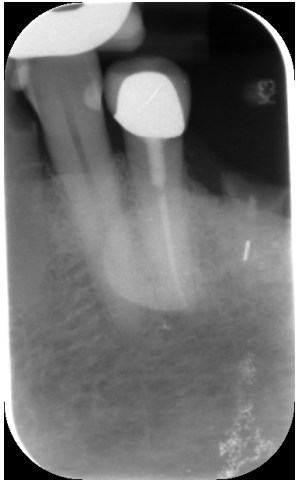
Crown encircles post and tooth. Most important part that cc engages is the tooth (longevity).

Radiographic Appearance of Posts

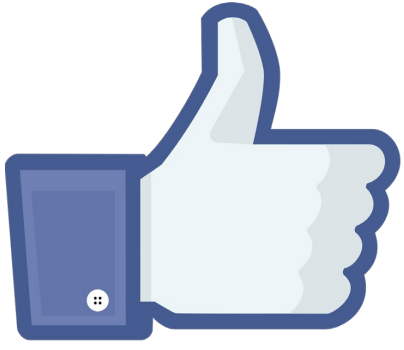








Desirable Features of Posts



- Biocompatability
- Maximal retention inside the root
- Maximal protection against root fracture Not too wide
- Maximal retention for the core and crown
- High radiographic visibility Good for future work
- Pleasing esthetics, when indicated (most important for **anterior cases with thin tissue biotype**)

Types of Posts

Prefabricated posts	Custom posts
Metallic (stainless steel/titanium alloy) • parallel-sided or tapered • active or passive Active has threads, like a screw. Not good. Lots of stress on root.	Cast metal posts (gold or base alloy) Usually gold is used. Soft and easier to adjust
Carbon or glass fiber-reinforced epoxy resin (smooth or serrated)	All-ceramic posts / Endocrowns
Ceramic posts (zirconia)	

A post does ***not*** strengthen or reinforce the tooth

Doesnt affect fracture resistance. Just retains core BU.

- Important distinction:
  - Inherent strength of the tooth and its resistance to fracture comes from the **remaining tooth structure and the surrounding alveolar bone**
  - **The tooth is weakened if dentin is sacrificed to place a larger diameter post**

Preservation is the guiding principle:

- in the decision to use a post
- in the selection of the post
- in the preparation of the post space

Post if BU needs additional retention

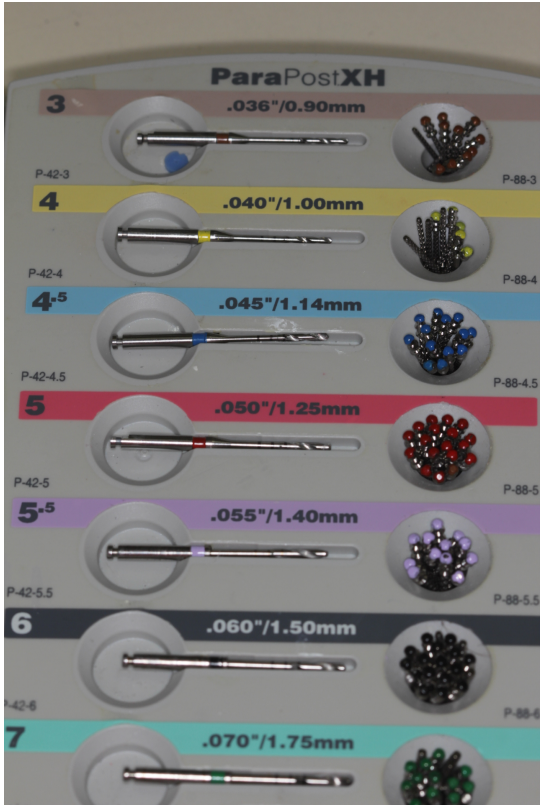
PREFABRICATED POSTS

Prefabricated Posts

- A separate core build up is required (amalgam/resin)
  - only one appointment is needed to finish **both** post and core

- Various sizes available to fit canal width

Parapost used in OHSU

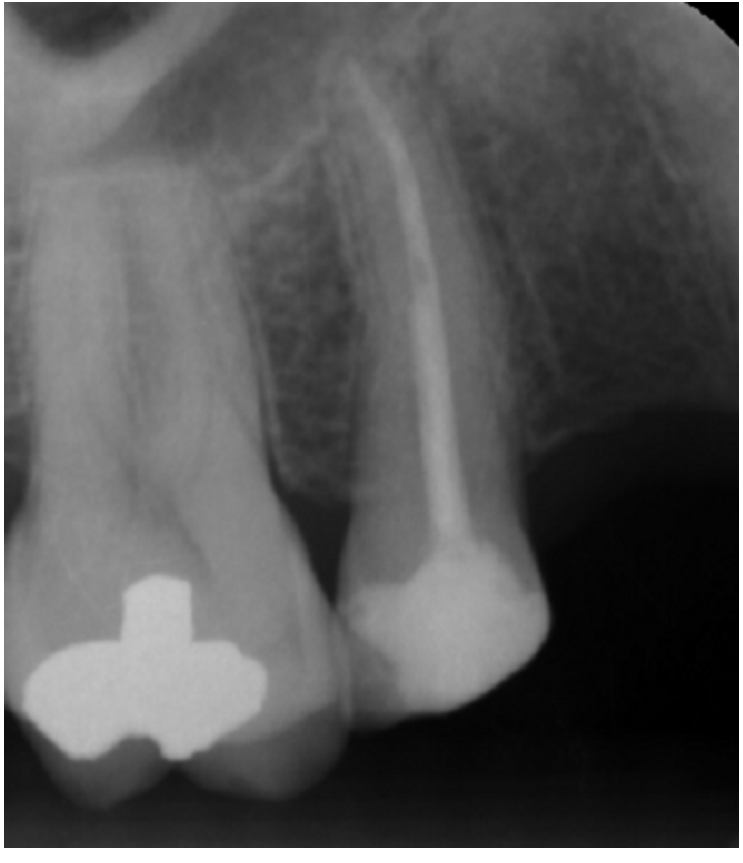


Brown yellow blue are used most of the time. Rarely use past blue; only very large canals

Prefabricated Fiber Posts

- Provide more esthetic result
  - Patients with thin tissue biotype
  - Patients with high smile line
- Require cementation with resin cements
  - What if they ever need to be removed (eg for endo retx)?
- Radiolucency can be a problem!
- **Post debonding/loosening: "preliminary failure"**
  - **Tooth may end up being non-restorable**

le bond them. Cement w same material used for BU

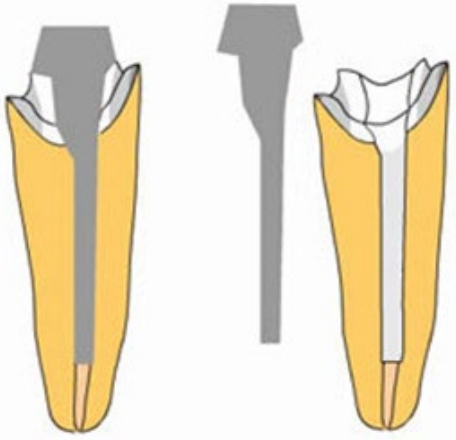


Radiographic appearance of a fiber-reinforced prefabricated post

CAST POSTS

Cast Posts

- Post **and** Core is one piece
- Used to replace more coronal tooth structure or to change tooth angulation
- Usually used on anterior teeth or premolars with larger canals, or when a root canal has "unique" shape



THE IMPRESSION IS CAST UP AT THE LAB AND A METAL POST IS MADE WHICH IS CEMENTED INTO THE TOOTH.

Cast Posts

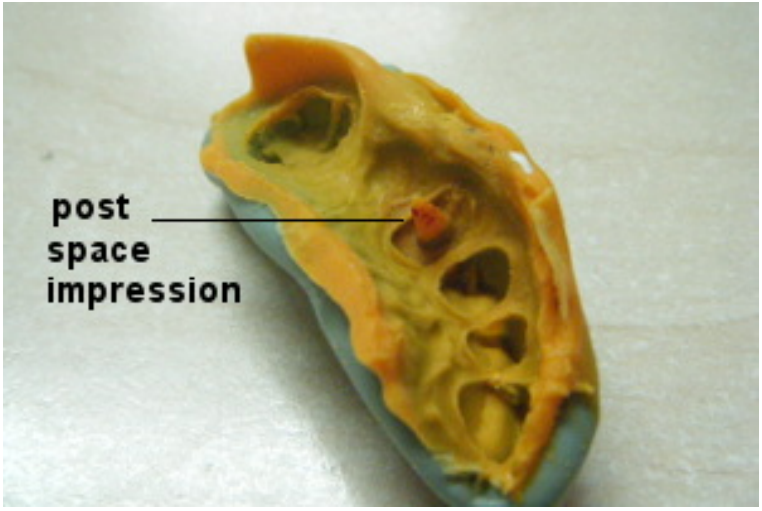
- 2 techniques available (direct or indirect)

- **For both techniques, two separate appointments are needed**

- **Direct technique:**
  - Post space preparation and fabrication of individual resin pattern
  - Pattern is sent to the lab for casting
  - Second appointment: cementation

Cast Posts

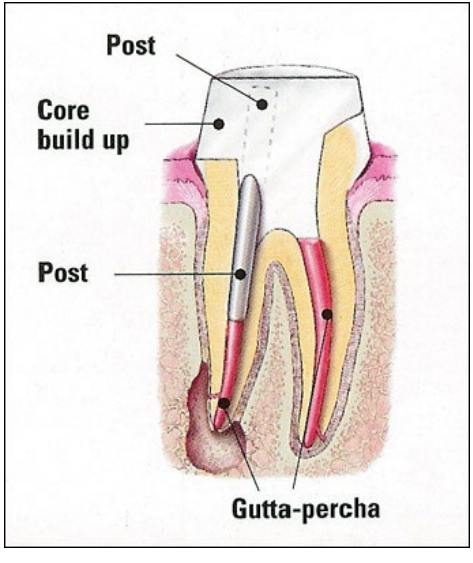
- **Indirect technique:**
  - Post space preparation and impression of the canal
  - Impression sent to the lab, post pattern created in the lab
  - Second appointment: cementation



CONSIDERATIONS FOR POST LENGTH

Guidelines for selection of post length

- *Studies in early 1980's:*
  - Almost all specimens leaked when 2mm gutta-percha was retained
  - Most specimens leaked with 3mm retained gutta-percha
    - ***Also, those teeth showed more post-op PA radiolucencies***

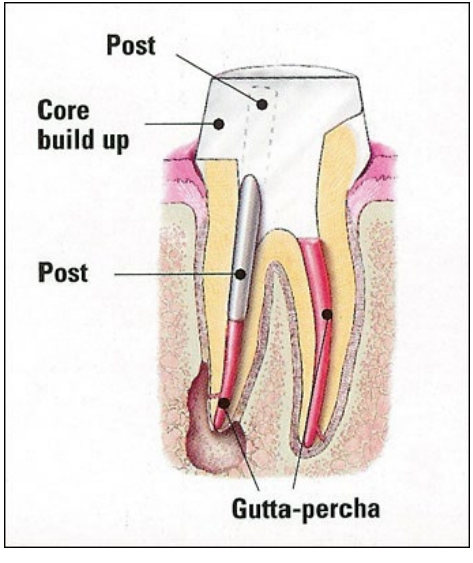


More accessory canals at apex.
Need GP there

Guidelines for selection of post length

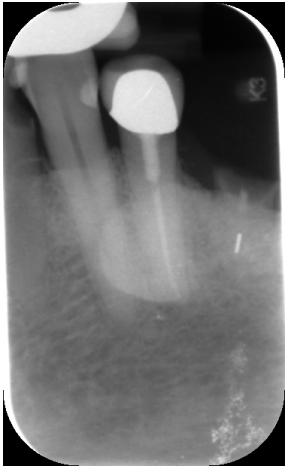
- **Retention of the apical 4 mm of gutta-percha is the minimum requirement for an endodontic seal**

- Due to possible radiographic variations, try to retain **5mm** (rather than 4mm) as measured on the radiograph



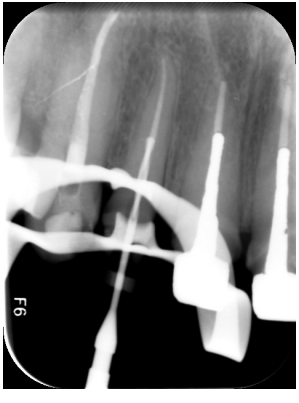
Guidelines for selection of post length

- **Optimal post length is the most important and safest method of increasing retention and preventing post loosening** *(Colley et al, Br Dent J 1968)*



Post end stops above bone level. No prevention of future fracture

- **If post ends at coronal third of the root: higher stresses, more fractures** *(Fuzz et al, J Endod 2001)*



Short post no good.

Guidelines for selection of post length

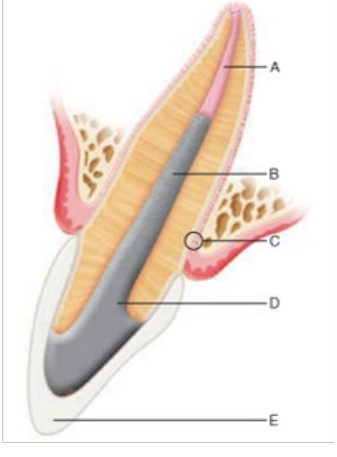
1. The post should be **as long as possible without disturbing the apical seal**

2. The post length should be **AT LEAST equal to the clinical crown length**

3. The post length should be **2/3 of the root length *that is surrounded by bone***

Use ruler. How much root inside bon

Or : The post length should be ¾ the length of the root



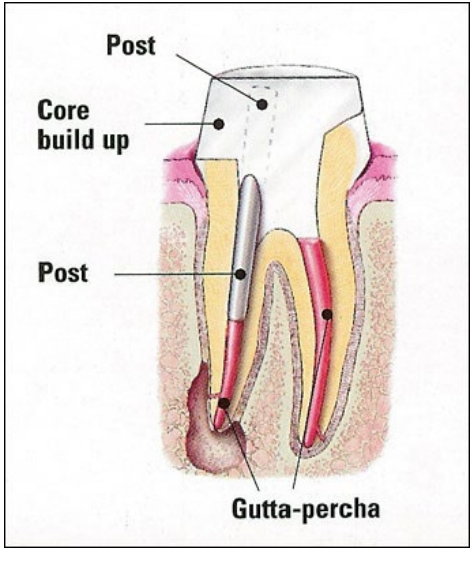
CONSIDERATIONS FOR POST DIAMETER

Guidelines for selection of post diameter

- **Increased post diameter ≠ Increased retention**

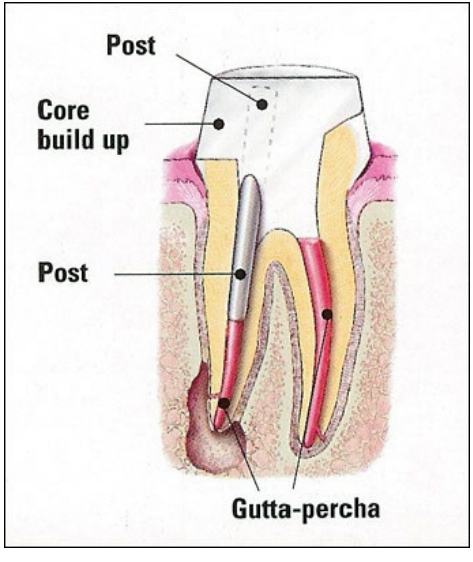
- When large diameter (>1.5mm) posts are placed, root fracture rate increases 6 times for every mm of decreased root diameter

  (Deutsch et al., JPD 1985)



Guidelines for selection of post diameter

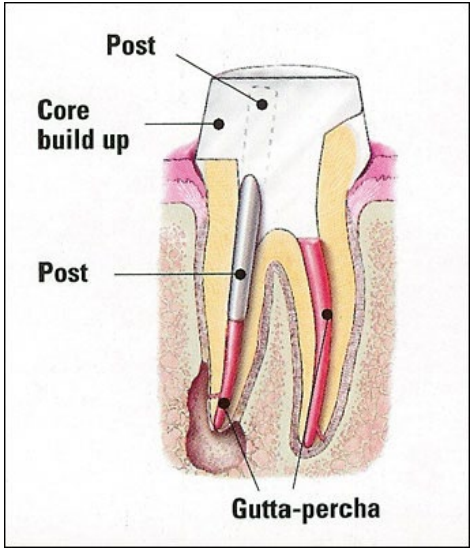
- The root should have more than 1 mm of dentin circumferentially remaining around the post
  - To prevent perforation
  - To provide fracture resistance



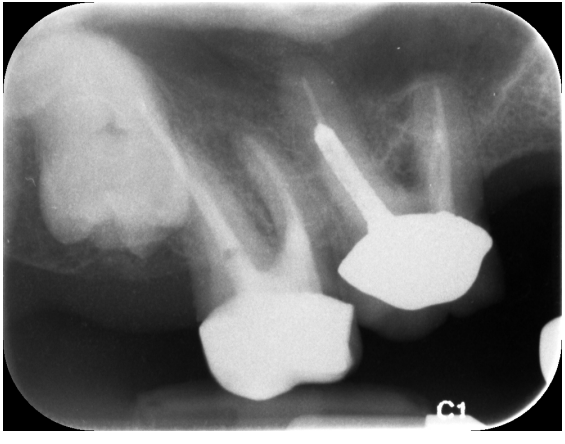
Guidelines for selection of post diameter

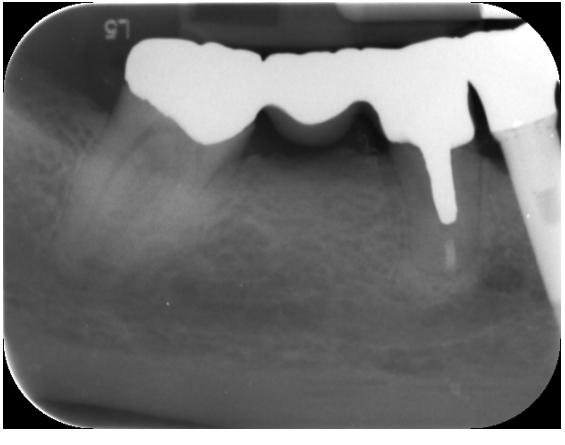
Post diameter should not exceed 1/3 the root diameter at the CEJ level

- **Other guidelines used in literature:**
  - *should be at least 2mm less than the root at the midpoint of the post*
  - *should be 1.5mm smaller than the root at the apical end of the post*



The post should be an **extension into the conservatively shaped root canal system**, not an intrusion into radicular dentin





Guidelines for selection of post diameter

- Safest technique to start post space preparation is the **use of heated instruments**

Guidelines for selection of post diameter

What about using chemical agents (chloroform etc.) for the removal of gutta-percha?

- Inability to control removal

What To Remember About Post Length & Diameter

- **Residual dentin should undergo minimal alteration** to accept the post
- **Post diameter** should be the minimum dimension needed to withstand functional loading
- **Post length** is dictated by the remaining bone support, the root anatomy, and the apex obturation (at least 4-5mm of gutta percha need to remain apically)

POST CEMENTATION

Post Cementation

- Zinc phosphate cement (long history of success, long working time)
- RMGI cement (improved early strength, low solubility) Used the most
- Resin cement (technique sensitive, questionable bonding to radicular dentin/inability for removal if restoration fails)

Post Cementation Guidelines

Post Type	Zinc Phosphate Cement	RMGI	Resin Cement
Cast Post and Core	x	x	
Prefab Metal Post	x	x	
Prefab Fiber Post			x

Post Cementation

- **For cast posts: After cementation, avoid further preparation for 24 hours**
  - Allow cement to reach maximum compressive and tensile strength

➢ Importance of making a post&core pattern that closely follows the ideal preparation for that specific tooth (use preparation matrix!)

POST FAILURES

Post Failure:

Endodontic Perspective

- Incidence of apical problems and caries are higher in teeth with posts
- 91% of fractured endodontically treated teeth had poorly designed posts
  - Too long, too wide, or both

Cohen S. & Hargreaves K.M.: Pathways of the pulp, Mosby, 9th ed., 2006.

Post Failure:

Restorative Perspective

Most common problems with posts

- Post loosening (5%)
- Root fracture (3%)
- Caries (2%)
- Periodontal disease (2%)

Goodacre et al, Clinical complications in Fixed Prosthodontics, JPD 2003; 90 (1).

Thank You!