Restoration of endodontically treated teeth
Restoring endodontically treated teeth
Decision making

- Post required or not
- Retain the core build up material
- Reinforce the remaining coronal tooth structure
- Type of restoration
- Able to dissipate or absorb the energy of function and even overcome moderate trauma.
Indication of post placement
Anterior teeth

Incisors:
- receive shear forces
- fracture resistance is not affected by post placement
- post placement not indicated in general
• Post placement indication:
- inadequate remaining tooth structure or complete-coverage
Indication of post placement
Anterior teeth

Upper first incisor, canine

• Post indication based on:
  • -remaining tooth structure adequacy
  • -function
  • -occlusion
Indication of post placement

Posterior teeth

• Receive vertical forces
• Pins should not be placed

Post placement indication:

• -Reinforcement of the coronal tooth structure is not commonly needed
• -If other more conservative retention and resistance features cannot be used
• -tooth is to serve as an abutment
Post placement
Posterior teeth

- upper molars: palatal canal
- lower molars: distal canal
Indication of post placement
Posterior teeth

Upper premolars:
-subjected to a mixture of shear and compressive forces

Post indications:
•-serve as an abutment
•-tall clinical crown
•-receive lateral stress

Short clinical crown: post is not indicated
Post placement
Posterior teeth

Upper premolars:
- Delicate internal morphology
  - Minimal or no further canal enlargement after RCT
  - Conservative tapered post choosing
Ideally post system requires no further preparation after removal of gutta-percha
Choosing a post system
prefabricated posts

Post-tooth combination

Variables which affect the results:

• post design
• post length
• post diameter
• venting
• surface roughness
• canal preparation
• method of cementation
• luting medium
Post design

Depending of the amount of the retention
- active threaded post – greatest retention
- parallel
- tapered – least retention
- hourglass
- hybrid parallel-tapered
- Parallel or tapered post:
  - adequate length – 7-8 mm
  - normal canal configuration
- Active post
  - funnel shaped canal
  - minimal available post space
Post length

Increased post length – increased retention
• minimum 4mm guttapercha should be left
• passive post should be as long as possible

Cave:
• perforation
• encroaching on the remaining guttapercha
• post length need only be the same as the height of the tooth crown or at least one half the length of the root canal
Post diameter

• Endodontically treated teeth more susceptible to fracture
• Fracture resistance affected by the amount of the removed dentin
• Increased diameter increase the internal stress
• Diameter should be as small as possible while retaining the necessary rigidity
Post material

• metals,
• ceramics,
• fiber-reinforced
• resin-based substrates
• use of translucent posts in the esthetic zone.
• metal post can cause shadowing of the soft tissues adversely affect the esthetic results required of bonded resin and ceramic restorations in the anterior region.
Requirements
Venting

- Intraradicular hydrostatic pressure created during cementation
- Prefabricated posts have the venting mechanism incorporated in their design
- Cementing material need place to escape
Surface roughness

- Surface texture is incorporated in prefabricated post
- smooth
- serrated
- threaded
- Heads of some posts have retention features
- Air abrading, notching increase post retention
Canal preparation

• Immediate
• Delayed
• Preparation with rotary instruments
• Use of heated instruments
• Use of solvents
• Routinely enlargement is not recommended
Method of cementation

• Placement of the cement on the post – coated with
• Placement of the cement in the canal with
  - lentulo spiral
  - paper point
  - endodontic explorer
- needle tube: insertion, cement extrusion, slow removal
Luting cements

- Zinc phosphate
- Polycarboxylate
- Glass ionomer
- Filled resin composite, Unfilled resin composite

- Technique sensitive
- Conditioning of the dentin
- Setting can be inhibited by the sealer

None of these can overcome a poorly designed post
Post removal

• metal post:
  -expose the post, apply ultrasonic forces to break the cement/post interface, and grasp the post with a post-pulling instrument for removal.

• Fiber reinforced post:
  -use of rotary instruments within the root canal can effectively and efficiently remove fiber posts essentially by hollowing them out of the root canal
Prefabricated posts
Passive tapered post

• the canal be prepared larger than the post
• retention is accomplished by cementing the post into the canal with a luting material
Prefabricated posts
Passive tapered post

• Natural canal shape is tapered – good fitting
• Post can be modified
• Provide the least retention
• Retention can be gained through increase the length
• Wedging effect – increased stress, root fracture

Indication:
- small canals
- thin, fragile roots (maxillary premolars)
- routinely with providing the adequate length
Prefabricated posts
Passive parallel post

- Parapost (Whaledent)
- Greater retention than the tapered post
- Tapered canal must be enlarged to accommodate to the post

Indication:
- Increased retention is needed
- Preparation is not jeopardize the root integrity
Prefabricated posts

Active post

• preparing the root canal with a slightly undersized post drill
• primary retention is through a frictional fit to the walls.
Prefabricated posts
Active post

- V-Lock (Brasseler), Flexipost (Essential Dental System)
- Screws into the dentin

Available styles:
- tap
- self-tapping post
- split-shank post
- hybrid post (both active and passive features)

- Potential for vertical fracture during placement
- After complete seating should be unscrewed one forth of a turn – results decreased residual stress
- Shorter length - produce less stress

Indication:
- inadequate canal length (short tooth, partially occluded canal)
- gain adequate retention
Retention triad

The force that resist a tensile or pulling force
1. Adequate post length (7-8 mm and 4 mm guttapercha left)
2. Post style (active or passive)
3. Luting agent (remove root canal contaminants noninvasively)
Resistance triad

In combination:
1. Ferrule effect (margin in natural tooth structure, extend 1.5 mm, encircle)
2. Vertical remaining coronal tooth structure (keep as much as possible)
3. Antirotation (elongated or oblong canal, auxiliary pins or keyways)
Orthodontic eruption, crown-lengthening surgery
Fiber-reinforced composite posts

- were introduced in the United States in 1995, fabricated with carbon fibers
- excellent physical properties
- black color
- More esthetic fiber posts were developed
- Compared to ceramic posts, esthetic fiber posts provide endodontically treated teeth with higher fracture resistance.
Fiber-reinforced composite posts

- Fiber-reinforced posts are not as rigid as metal or ceramic posts
- The thinner the root, the greater the flexion, and the greater the failure
- Failure occurs at the interface between the restorative material and the tooth
Cementation – fiber post

- Bonding within a root canal with traditional total-etch adhesives, it is critical that the phosphoric-acid etchant be thoroughly rinsed from the root canal and that the canal be dried.
- Type of sealer: the presence of eugenol within the root canal resulted in significant loss of retention.
Cementation – fiber post

• Eugenol containing sealer:

• irrigating the canal with ethyl alcohol (ethanol) or etching with 37% phosphoric acid

• -use a 10-second phosphoric-acid irrigation to remove residual eugenol; rinse and dry the canal; follow with a second 15-second definitive etch of the canal with phosphoric acid; rinse the canal with water using an endodontic irrigation syringe; and dry the canal of excess moisture using paper points and a microaspirator tip within the canal
Cementation – fiber post

- fourth-generation, total-etch, multi-bottle adhesive systems have been shown to be acceptable with dual-cure and self-cure resin cementation
- some single-bottle adhesive systems (fifth generation) do not bond well to self-cure and dual-cure composite resins because of the acidity of the single-bottle primer/adhesive.
Cementation – fiber post

• the depth of penetration of the curing light
• self-etch, dual-cure composite resin cements have been introduced
Post placement step by step
Post placement step by step
Luting cement
• To achieve good clinical success, the clinician must choose the clinical circumstances where a fiber post is indicated, choose compatible materials and techniques for cementation
Definitive restorations

• Different for anterior and posterior teeth
• Challenge to the restorative dentist
• Good judgments:
  • Concerning the periodontal status
  • The remaining tooth structure
  • The prognosis of the endodontic treatment.
Rigidity

• Once a tooth was prepared, the rigidity was reduced.
• occlusal cavity preparation reduced tooth stiffness by 20%,
• loss of marginal ridge integrity with a mesial-occlusal-distal preparation reduced cuspal stiffness by 63%.
• an endodontic access preparation reduced relative tooth stiffness by a mere 5%.
Anterior teeth

- Fracture resistance is quite same like vital tooth
- No need to place post
- Resin composite restoration
- Indirect restorations
- 50% of coronal enamel remains: veneer
Posterior teeth

Molars:
• Vertical forces
• Access preparation: minimal effect on the fracture resistance
• MOD preparation: bonded restoration is needed – resin composite
Posterior teeth

- Premolars

- In the first 3 years – amalgam restoration greater incidence of cuspal fracture

- Advantages of resin composites is not as good as in molar cases

- Restorations with fiber posts and composite were found to be more effective than amalgam in preventing root fractures but less effective in preventing secondary caries