

Root Canal Posts

According to a recent review, we do not have sufficient information to decide which type of post is best. In EBD, clinical trials, with all of their uncontrollable variables, are given disproportionate significance over in-vitro studies, which allow isolation of variables.

- Bolla M, et.al. Root canal posts for the restoration of root filled teeth. *Evid Based Dent* 2007;8:42

Naturally there are factors such as root form or canal geometry which are not fully elucidated, but a lot of information is available..

Vertical root fractures

Vertical root fractures have been observed most frequently with threaded posts, custom cast gold posts are in second place.

- Fuss Z, et.al. An evaluation of endodontically treated vertical root fractured teeth; impact of operative procedures. *J of Endodontics* 2001;27:46-8

The risk of non-restorable root fracture is reduced with bonded FRC posts.

- Mannocci F, et.al. Intermittent Loading of Teeth Restored using Quartz Fiber, Carbon-Quartz Fiber, and Zirconium Dioxide Ceramic Root Canal Posts. *J Adhes Dent* 1999;1:153-8
- Akkayan B and Gulmez T. Resistance to Fracture of Endodontically Treated Teeth Restored with Different Post Systems. *J Prosthet Dent* 2002;87:431-7
- Cormier CJ, et.al. In vitro comparison of the fracture resistance and failure mode of fiber, ceramic, and conventional post systems at various stages of restoration. *J Prosthodont* 2001;10:26-36
- Newman MP, et.al. Fracture resistance of endodontically treated teeth restored with composites posts. *J Prosthet Dent* 2003;89:360-7
- Hayashi M, et.al. Fracture resistance of pulpless teeth restored with cores and crowns. *Dent Mater* 2006;22:477-85
- Heydecke G, et.al. Fracture strength and survival rate of endodontically treated maxillary incisors with approximal cavities after restoration with different core systems; an in-vitro study. *J Dent* 2001;29:427-33
- Hu YH, et.al. Fracture resistance of endodontically treated anterior teeth restored with four systems. *Quintessence Int* 2003;34:349-53

This is true for crowned teeth, but also for teeth with intracoronal restorations. If FRC posts were placed in endodontically treated premolars; the fracture strength was increased only moderately compared to the teeth without posts. However, the teeth with fibre posts showed mostly fractures which permitted a new restoration, those without were generally non-restorable.

- Sorrentino R, et.al. Effect of post retained composite restoration of MOD preparations on the fracture resistance of endodontically treated teeth. *J Adhes Dent* 2007;9:49-56
- Salameh Z, et.al. Fracture resistance and failure patterns of endodontically treated mandibular molars restored using resin composite with or without translucent fiber posts. *J Endodontics* 2006;32:752-5

Clinical results published to date reflect the in-vitro studies.

- Monticelli F, et.al. Clinical behaviour of translucent fiber posts; a 2-year prospective study. *Int J Prosthodont* 2003;16:593-6
- Ferrari M, et.al. Clinical evaluation of fiber-reinforced epoxy resin posts and cast post and cores. *Am J Dent* 2000;13:8-15

Posts do not “strengthen” the root in relation to vertical fracture, but can significantly reduce the risk of cervical fracture.

- Mendoza DB, et.al. Root Reinforcement with a Resin-Bonded Preformed Post. *J Prosthet Dent* 1997;78:10-14
- Rosentritt M, et.al. In vitro fracture resistance and marginal adaptation of metallic and tooth-coloured post systems. *J Oral Rehab* 2004;31:675-81

Fiber posts restore much of the original hysteresis of natural teeth by undergoing elastic rather than plastic deformation, even though the argument of “modulus like dentin” is nonsense.

- Pfeiffer P, et.al. Yield strength of zirconia and glass fiber-reinforced posts. *J Oral Rehab* 2006;33:70-4
- Goto Y, et.al. Fatigue resistance of endodontically treated teeth restored with three dowel-and-core systems. *J Prosthet Dent* 2005;93:45-50

Ferrule Effect

The failure rate for conventionally cemented crowns without a ferrule is increased by 800%.

- Sorensen JA and Engelman MJ. Ferrule design and fracture resistance of endodontically treated teeth. *J Prosthet Dent* 1990;63:529-36.

In the fairly common clinical situation with minimal or no ferrule effect interproximally, studies show a clear advantage of adhesive FRC posts, with fracture strengths similar to complete ferrule preparations. The necessity of surgical crown lengthening or orthodontic extrusion is certainly reduced, although the patients should still be informed of the risk.

- Dikbas I, et.al. Evaluation of the Effect of Different ferrule Designs on the Fracture Resistance of Endodontically Treated Maxillary Central Incisors Incorporating Fiber Posts, Composite Cores, and Crown Restorations. *J Contemp Dent Prac* 2007;7:62-9
- Naumann, M., Preuss, A., Rosentritt, M. Effect of incomplete crown ferrules on load capacity of endodontically treated maxillary incisors restored with fiber posts, composite build-ups, and all-ceramic crowns: An in vitro evaluation after chewing simulation. *Acta Odontol Scand* 2006;64:31-36
- Dietschi D, Rossier-Gerber S, Krejci I. Adaptation of Adhesive Post and Cores to Dentin after In Vitro Loading: Evaluation of Post Material Influence. *J Adhes Dent* 2006;8:409-19

Loss of Retention

The most frequent failure is loss of retention (true for all posts). The bond to canal dentin is not ideal, because of the high tubule area. Note: Single component self-etching adhesives show poor results, perhaps because of the minimal osmotic gradient from the periodontal ligament space. The post should be cleaned and treated with silane, but this is not the weak link.

Leaving aside the problems caused by stupid material recommendations and idiotic instructions for use, the significance of the dentin bond is reflected in the retention values related to post length. Increasing post length from 5 to 10 mm improved retention in epoxy blocks (excellent bond), but had no effect in natural teeth, with all failures between cement and dentin.

- Innella R, et.al. Relation between length of fiber post and its mechanical retention. *Minerva Stomatol* 2005;54:481-8

This is due to the restricted shrinkage. If the thickness of the shrinking composite exceeds 0.1 mm, even a dentin bond strength of 50 MPa would not prevent gaps.

Cementation of FRC posts

Compromises during cementation of fiber posts should not be made:

- ✓ Achieve primary stability of the post in the canal during try-in (if required increase length, diameter, or switch to a parallel post). This is the only way to assure a minimal film thickness of the cement and true adhesion.
- ✓ Use a two component adhesive (self-etch or etch-and-rinse, I prefer the latter). If the dentin is etched, observe the solvent requirements in relation to dentin moisture.
- ✓ Use a microbrush to “scrub” the walls with the adhesive.
- ✓ Dry every adhesive thoroughly before placing the cement and post. Do NOT precure.
- ✓ Use a dual-cured cement, do not rely on light curing alone.
- ✓ The post space must be filled from the bottom up, use a lentulo or small injection tip.
- ✓ Hold seating pressure for adequate time, there is a lot of hydraulic force to overcome.
- ✓ If you have primary stability, but only in the apical section, postbond immediately after polymerization, do NOT contaminate or re-etch.

For at least one author, the evidence is clear enough to make an unconditional recommendation for adhesive FRC posts followed by adhesive restoration.

- Dietschi D, et.al. Biomechanical considerations for the restoration of endodontically treated teeth: a systematic review of the literature, Part II. Quintessence International 2008;39:117-29

I agree.