AUGMENTED POST-CORE BIBLIOGRAPHY
(October, 2014)

Studies that include Accessory Posts as at least one test group are in green

Aggarwal, V., Singla, M., Miglani, S., Kohli, S. **Comparative evaluation of fracture resistance of structurally compromised canals restored with different dowel methods.** *J Prosthodont. 2012 Jun;21(4):312-316. doi: 10.1111/j.1532-849X.2011.00827.x. Epub 2012 Feb 19.*

Purpose: The objective of this in vitro study was to evaluate and compare the fracture resistance and fracture mode of endodontically treated teeth with wide root canals restored with various dowel methods. **Methods:** Fifty human uni-radicular mandibular premolar teeth were de-coronated and endodontically-treated. The canals were widened with diamond points. The specimens were divided into five groups on the basis of type of dowel method used: conventional custom-made cast metal dowel; single glass fiber-reinforced resin dowel; glass fiber-reinforced resin dowel with accessory fiber dowels; relined glass fiber-reinforced resin dowel; and dowels formed with the help of polyethylene fiber ribbon-reinforced resin composite. Specimens were restored with indirect composite crowns, and 150,000 cycles of cyclic loading were applied. The specimens were loaded to test the fracture resistance and fracture mode (repairable and non-repairable). **Results:** The cast metal dowel groups had the highest fracture resistance but showed non-repairable fracture in 90% of specimens. **Conclusions**: Cast metal dowels had the highest fracture resistance but led to non-repairable fracture while restoring the wide root canals under cyclic loading. Specimens restored with fiber dowels, accessory dowels, relined dowels, and ribbon-reinforced resin provided adequate fracture resistance with increased incidence of repairable fractures. **PDF**

Akkayan, B., Gaucher, H., Atalay, S., Alkumru, H. **Effect of post geometry on the resistance to fracture of endodontically treated teeth with oval-shaped root canals.** *Canadian journal of restorative dentistry and prosthodontics. Summer 2010 Pages 20-26.*

Abstract: Post-root canal adaptation represents an important role in the biomechanical performance of teeth and the post-core systems. Close canal adaptation with minimal tooth structure removal provides a conservative and long-lasting treatment for the restoration of endodontically treated teeth. In some cases the root configuration could anatomically be an oval form rather than a circular shape or the resulting preparation of the canal during endodontic treatment may produce an oval form. The purpose of this study is to evaluate the effect of different fibre reinforced post systems of different geometrical cross sections, oval and circular, on the fracture resistance of endodonticallytreated teeth with oval-shaped root canals. Methods: 40 maxillary intact human canines were selected for this study.The crowns of each root were sectioned at the cemento-enamel junction.The roots were divided into 4 groups of io teeth following endodontic treatment; Quartz fibre post with oval section (0FibOv); (2) Flexible resin-impregnated glass fibre stick (GFibSti); (3) Small diameter quartz fibre post with circular section and accessory cone (0FibCirAcces); (4) Glass fibre post with circular section (GFibCir). Root canal preparations were performed with the special preparation drills provided in each system. All posts were cemented with self-adhesive dual polymerizing resin cement and light-polymerized composite cores were formed. Specimens were then embedded in auto polymerizing acrylic resin melds and secured in a universal testing machine with the use of a device that allowed loading of the specimens lingually at 135 degrees to the long axis. A compressive force was applied at a crosshead speed of 1 mm/min until fracture occurred. The fracture loads (N) were determined and the data were analyzed by 1-way ANOVA with interaction followed by Tukey HSD tests. Results: The mean failure loads (Newtons) and standard deviations (SDs) of the different post groups were calculated. The highest fracture resistance was recorded for group 3 teeth (0FibCirAcces) at 635.6 N; followed by group 1 (0FibOv); group 4 (GFibCir); and group 2 (GFibSti) at 488.4 N, 449.3 N, and 314.8 N respectively. Between-group differences in the fracture resistance of teeth were significant ($p < .001$) except for groups 1 and 4 ($p > .o5$). Teeth in all 4 experimental groups displayed favourable fractures. No catastrophic failures were present and there were no root fractures. All fractures displayed favourable, repairable modes. Conclusions: It can be speculated that cross-sectional similarity between the root canal configuration and the geometric form of the pre- fabricated post system is an effective variable on the fracture resistance of endodontically treated teeth. Using accessory posts to fill the post space and decrease the cement layer thickness may result in higher values. **PDF**

Alkumru, H., Akkayan, B, et al, **Fracture strength of teeth in oval-shaped root canals restored with posts and accessory post systems.** *Canadian Journal of Restorative Dentistry & Prosthodontics/— Vol. 6, No. 1 — Spring, 2013.*

In contemporary restorative dentistry, post-root canal adaptation always represents an important role in successful and long-lasting treatment for the restoration of endodontically treated teeth. In some cases posts have to be placed in wide oval-formed root canal spaces. However, the impact of the treatment outcome of the increasing non-uniform cement thickness around the posts has not yet reached a consensus. The purpose of this research is to assess the treatment outcome of post systems with three different post geometries, combined with/without accessory posts as an alternative technique in the oval-shaped canals. Seventy-two teeth with oval-shaped canals were selected for the study. Crowns were sectioned at the cemento-enamel junction and endodontically

treated. The roots were randomly divided into 2 groups of 36 specimens and each group was split into 3 subgroups of 12 as follows; G1-A, Quartz fiber post with double tapered cross-section (QFibDT); G1-B, Quartz fiber post with circular cross-section (QFibCir); G1-C Quartz fiber post with oval cross-section (QFibOv); G2-A Quartz fiber post with double tapered cross-section + two accessory quartz fiber posts (QFibDTAcces); G2-B Quartz fiber post with circular cross-section + two accessory quartz fiber posts (QFibCirAcces); G2-C Quartz fiber post with oval cross-section + two accessory quartz fiber posts (QFibOvAcces). Root canal preparations were performed with low-speed Torpan Drill tips of ISO 90, ISO 100 and ISO 120 in increasing order. All posts were cemented with self-adhesive dual polymerizing resin cement. Two specimens from each group were randomly chosen upon the cementation of all posts and processed for stereomicroscope (SM) evaluation of the fiber post-cemented interface. All sixty specimens were then embedded in auto polymerizing acrylic resin surrounded by aluminum cylinders and light-polymerized composite cores were produced. Pressed all ceramic crowns were cemented on each core. Specimens were secured in a universal testing machine with the use of a device that allowed loading of the specimens lingually at 135 degrees to the long axis. A compressive force was applied at a crosshead speed of 1 mm/min until fracture occurred. The fracture loads (N) were determined and the obtained data were analyzed by 1-way ANOVA with interaction followed by Tukey HSD tests. Student's t test was used for between group comparisons. Representative stereomicroscope images and cement thickness measurements were performed on 2 mm sectioned specimens. Within-group comparisons for Group 1 specimens demonstrated statistically higher fracture strength values for groups cemented with G1-A, DT Light Post (590 N) and G1-B, Match Post (570,9 N) groups compared to G1-C, Ellipson Post group (400,83 N) ($p<.001$). The highest fracture resistance was recorded for G2-A (QFibDTAcces) at 764,18 N, followed by group G2-B (QFibCirAcces) at 726,5 N. Within-group comparisons of these two groups (G2-A, G2-B) resulted in statistically higher fracture resistance of teeth compared to G2-C (QFibOvAcces) at 574,96 N ($p<.001$). Regardless of the post system geometry tested in this study, Group 2 specimens resulted in statistically higher fracture strength values compared to Group 1 specimens according to between group comparisons ($p<.001$). No catastrophic failures were present and there were no root fractures. It can be speculated that when restoring with posts, especially in wide oval-shaped canals, the use of accessory posts reduces the cement thickness around the posts thus increasing the endodontically treated teeth resistance to fractures. **PDF**

*Al-Tayyan, Mouhammad, H.,, Watts, DC, Kurer, HG, Qualtrough, A. **Is a "flexible" glass fiber-bundle dowel system as retentive as a "rigid" Quartz fiber post system?** *Journal of Prosthodontics **17** (2008) 532–537*

Purpose: This study had two aims: (1) to compare the retention of a flexible directly placed fiber-bundle dowel system with that of a rigid prefabricated fiber-reinforced composite (FRC) dowel system, and (2) to determine the effect of decreasing the volume of luting cement around the flexible fiber-bundle dowels on the axial retention of the restorations. **Methods:** Single-canal premolars (n = 36) were decoronated, cleaned, shaped, and prepared for both flexible and rigid dowels to a depth of 10 mm using a size 2 drill. The roots were then randomly allocated into three groups: Ia, Ib, and II (n = 12). Flexible fiber-bundle dowels were placed in groups Ia and Ib. These were available in three fiber-bundle diameters: small (0.9 mm), medium (1.2 mm), and large (1.5 mm). These bundles were luted in the root canals with Variolink II. The differences between Ia and Ib were in the ratio of the volume of fiber-bundles to the volume of luting cement and in the mode of application. Medium fiber-bundles were placed to the end of the preparation in groups Ia and Ib; however, in group Ia, a small diameter auxiliary bundle was placed, whereas in group Ib, a large-diameter auxiliary bundle was cut axially into strips of circa 0.2-mm thickness before being sequentially overlapped in placement. Roots in group II were restored with size 2 rigid prefabricated fiber dowels and luted with the light-cured cement provided by the manufacturer. After 24 hours of storage, axial tensile forces were applied to all luted dowels progressively to failure at 0.5 mm/min. Data were analyzed using a one-way analysis of variance (ANOVA) and the Bonferonni test. **Results:** The mean axial resistance forces (standard deviation [SD]) for groups Ia, Ib, and II were not statistically different at 166 (49), 157 (36), and 151 (44) N, respectively ($p > 0.05$). **Conclusions:** There was no significant difference between the retention of the flexible fiber-bundle dowel system and that of the rigid prefabricated fiber dowel system. Decreasing the volume of luting cement around the flexible dowels did not have a significant effect on the axial retention of the restorations. **PDF**

Ariki, E.K., , Gonçalves, M, Souza, ROA, Z , S.C.,Gia, PEL, Takahashi, F.E., Bottino, M.A, **Resin bond to root dentin: Accessory posts and dentin hybridization effect.** *J Dent Res. Vol 87 (Spec. Iss. A) Abstract 1748 (www.dentalresearch.org)*

Objective: To evaluate the influence of accessory fiber posts (AFP) and intra-radicular dentin hybridization (IDH) on the push-out bond strength of fiber post luted with resin cement to bovine root dentin. The null hypotheses were that the AFP using and IDH do not affect the push-out bond strength. **Methods:** The canals of forty single-root bovine roots (16mm in length) were prepared at 12mm using the preparation drill (N0 3, RTD, France). With an assistance of a modifier parallelometer, each root had your apical region (4 mm length) embedded in acrylic resin and the roots were randomly divided into four groups, according the luting procedures (N=10): Gr1- IDH + fiber post n0 3; Gr2- IDH + fiber post n0 1; Gr3- IDH + fiber post n0 1 + AFP; Gr4- Fiber post n0 3 without IDH. Except for the group Gr4, the specimens (sps) were treated with the adhesive system (All Bond 2) and the fiber posts (Macro- Lock Illusion) were luted (Duo-Link) and after stored in distilled water prior the mechanical test (24 h, 37°C). Each specimen was cut in 4 disc samples (1.8 mm in thickness), which were submitted to the push-out test on a universal test machine (EMIC, model DL-1000) at a speed of 1mm/min. The data (MPa) were analyzed statistically by one-way analysis of variance (ANOVA). **Results:** The means (± standard deviation) values obtained after push out test were: Gr1- 5.4±1.3 MPa; Gr2- 4.2±2.4 MPa; Gr3- 4.6±1.5 MPa; Gr4- 3.3±1.7 MPa. The statistical analysis didn't observe influence among the groups ($p=0.0966> 0.05$). The null hypotheses were accepted. **Conclusion:** The AFP and the IDH do not improve nor diminish the bond strength of fiber post luted to bovine root dentin.

Ayad M. F., Maghrabi, A., A. & Garcia-Godoy F. **Resin composite polyethylene fiber reinforcement: Effect on fracture resistance of weakened marginal ridges.** *Am J Dent 2010;23:133-136*

Purpose: To investigate the in vitro effect of polyethylene woven fiber reinforcement of resin composite on the fracture resistance of weakened marginal ridges in molar teeth. Methods: 50 sound extracted human mandibular molars were used. Specimens were divided into five groups (n=10). Group 1: served as a control for comparison; Group 2: Class I cavity preparation with resin composite (Prodigy); Group 3: Class I cavity preparation with polyethylene ribbon fiber (Ribbond) and resin composite. Group 4: Class II cavity preparation with resin composite restoration; Group 5: Class II cavity preparation with polyethylene woven fiber and resin composite. Specimens were stored in 100% humidity at 37°C for 7 days. Compressive loading of the teeth was performed with a universal testing machine at a cross-head speed of 0.5 mm/minute until failure. The data were analyzed with 1-way ANOVA followed by the Ryan- Einot-Gabriel-Welsch Multiple Range Test (α= 0.05). Results. Reinforcement with polyethylene fiber resulted in significant differences for fracture resistance (P< 0.001). Mean fracture resistance (SD) was [1737.4 (84.8) N] for control group. Among the experimental groups, the highest mean fracture resistance (SD) [1543.8 (71.1) N] was associated with Class I cavity preparation with polyethylene fiber and resin composite. The lowest mean fracture resistance (SD) [869.2 (91.7) N] was recorded for Class II cavity preparation with conventional resin composite. **PDF**

Baldissara, P.,, V., Valandro, L.F. Arena, A., Scotti, R. **Non-axial Loading of crowns supported by new fiber post systems.** *J Dent Res. Vol 89 (Spec. Iss. B) Abstract #2195, 2010 (www.dentalresearch.org)*

Objectives: to evaluate the behavior of non-circular fiber post and accessory posts in supporting non-axially loaded cast metal crowns. Concerns remains about fiber posts used under crowns connected to RPDs using frictional attachments: the hypothesis tested is that an increase in the emerging section of fiber posts doesn't affect the restoration survival rate**. Methods:** 4 groups: 1)non-circular fiber post concept Ellipson; 2) Fibercone secondary post system (two posts) coupled with one DT Light-Post Illusion #0.5; 3) conventional DT Light-Post Illusion #1; and 4) Macro-Lock Illusion #1, all from RTD, France. 48 single rooted, crownless human teeth were selected and endodontically treated. The canal shape was standardized using the Ellipson ultrasonic diamond tip (Suprasson P5 Newtron, Satelec, France) to obtain a non-circular section, then the teeth were randomly distributed to the 4 groups. Panavia F and Photocore (Kuraray) were used as luting and core materials, respectively. Core was made using transparent shells. The specimens were prepared with chamfer margins and 1.5mm ferrule height. Cast metal crowns with 5mm off-set extensions were made using CrCo alloy (Vivi) and luted with Fuji Plus (GC). The crowns were subjected to 3.2 million cycles ranging from 100N to 150N under water irrigation. Kaplan-Meyer survival analysis was performed to compare the groups (α=. 05). **Results:** the Fibercone accessory post group showed the highest survival rate (0.667), followed by Ellipson (0.583) and Macro-Lock (0.500) groups. Conventional DT post showed the lowest survival rate (0.333). The difference among the groups was not statistically significant (p=0.068). **Conclusion:** Since non-axial loading generates torsion forces, non-circular post design could better resist this type of stress. Although the number of the specimens is too low to reject the null hypothesis, the survival data suggest that complete crowns restored with accessory and non-circular fiber posts have a higher survival rate in comparison to conventional posts.

Belli, S., Eraslan, O., Eraslan, O., Eskitascioglu, G. **Effect of post-restoration on stress-distribution in roots with over-flared canals.** *J Dent Res. Vol 91 (Spec. Iss. B) Abstract #160067, 2012 (www.dentalresearch.org)*

Objective: The aim of this finite element analysis (FEA) study was to test the effect of five different restorative techniques on stress distribution in roots with over-flared canals. **Method:** Six types of three-dimensional (3-D) FEA mathematical models simulating a maxillary incisor with supporting structures were created as follows: a) sound; b) with an over-flared root-canal restored using a prefabricated post; c) restored using one main and two accessory posts; d) restored with i-TFC system (Sun Medical, Japan); e) the thickness of the a root has been increased using composite resin and the root was then restored using a prefabricated post; f) an over-flared root restored with an anatomic post. The cores were created using composite resin. A 300-N static vertical occlusal load was applied on the node at the center of occlusal surface of the tooth to calculate stress distributions. Solidworks / Cosmosworks structural analysis programs were used for FEA analysis. **Result:** The analysis of the von Mises stress values revealed that accessory post and i-TFC post system showed almost similar stress distribution. They both showed high stress areas at the buccal side of the root (3.67 MPa) and at the cervical region (>3.67 MPa) and low stress accumulation within the post space (0-1 MPa). Anatomic post has kept the stress inside its body and forwarded less stress towards the remaining tooth and root structure and has showed an advantage for the remaining root structure. **Conclusion:** Creation of an anatomic post using composite resin and glass fiber post can save the remaining tooth structure in roots with over-flared canals.

Boksman, L, Hepburn, AB, Kogan, E, Friedman, M, de Rijk, W. Fiber post techniques for anatomical root variations. Dent Today. 2011 May;30(5):104, 106-11. **REVIEW ARTICLE**

In contemporary dental practice, there is no remaining reason to use metallic posts, custom or prefabricated. Many cases that several years ago would have required a retentive post will not require that post today, because of the many improvements in bonding agents and composite resin restoratives. However, in cases where less than 50% of coronal tooth structure remains--or in other cases wherein the judgment of the clinician a post is indicated--there are now aesthetic, non-corrosive, fracture resistant and radiopaque alternatives for all varieties that save time and money without compromise. Their most compelling advantage, regard-

less of the geometry or amount of residual tooth structure, is the protection from root fracture that a low modulus restoration provides. In selecting the materials (posts, resins) for these techniques, the dentist is advised not to cut corners, and to seek the strongest and most radiopaque products available.

Bonfante, G, Kaizer, O.B, Pegoraro, L.F, do Valle, A.L. **Fracture strength of teeth with flared root canals restored with glass fibre posts.** *Int Dent J. 2007 Jun;57(3):153-60.*

Objective: to investigate the fracture strength and pattern of failure of teeth with weakened roots reconstructed by different procedures. **Methods:** In an in vitro study root posts were placed in 50 endodontically treated canines, divided into 5 groups (n=10) as follows: cast metallic post; glass fibre post with smaller diameter than the root canal; glass fibre post with smaller diameter than the root canal + glass fibre strips; glass fibre post with smaller diameter than the root canal + accessory glass fibre posts; anatomical post (glass fibre post with smaller diameter than the root canal, relined with low viscosity composite resin). Posts were luted with resin cement and the coronal portion of posts was constructed with composite resin. Metallic crowns were cemented on the posts. Specimens were submitted to compressive load in a universal testing machine. Fracture strength values of each group were compared. **Results:** Fracture strength values were for Groups 1-5 respectively: 1087.06; 745.69; 775.41; 920.64; 876.12 kgf, with significant differences between Groups 1 and 2 and between Groups 1 and 3 ($p<0.05$). Observed patterns of fracture were: Group 1 - 100% of roots fractured; Groups 2 and 4 - variable fracture modes; Group 3 - 60% of fractures occurred in the cervical root third; Group 5 - 50% of failures occurred in the coronal portion of the post. **Conclusions:** The fracture strength of teeth with cast metallic posts, teeth with anatomical posts or teeth with glass fibre posts combined with accessory posts was similar. All teeth restored with cast metallic posts presented fractures and were unfavourable to maintenance of the remaining tooth structure. Teeth with fibre posts (Groups 2 to 5) presented variable fracture modes; however, the maximum percentage of unfavourable fractures was 30%. **PDF**

Braz, R, Conceição, AAB, Conceição, E.N., Loretto, S.C., Lyra, A.M.V.C., Silva, .A.K.S. **Evaluation of reinforcement materials used on filling of weakened roots**. *J Dent Res. Vol 84 (Spec. Iss. A) Abstract #1733, (www.dentalresearch.org)*

Objectives: The purpose was to evaluate flexural strength of glass fiber posts associated with filling materials used for root reinforcement, and fracture resistance of flared roots reinforced with the same materials. **Methods:** For flexural test, 10 cylinders, 3.5mm (diameter) and 14mm (length), were made for each group, according to the reinforcement material used: G1 - Reforpost (Angelus)+dual resin cement Variolink II (Ivoclar/VIvadent); G2 - Reforpost+dual composite core BisCore (Bisco); G3 - Reforpost+three accessory posts Reforpin(Angelus)+Variolink II. Cylinders were dry stored (24h) and tested in a universal testing machine (0.5mm/min). For fracture resistance test, 30 human maxillary canines were used and their crowns removed at the cement-enamel junction (CEJ). The canals were endodontically treated, after which the fillings were removed and the canals widened by 3.5mm, simulating flared canals. The dual adhesive system Excite DSC (Ivoclar/Vivadent) was applied to the roots, which were randomly divided into 3 groups as performed for flexural strength test. After the cementation, coronal complements were made with composite-resin and the roots were assembled in metallic cylinders filled with self-curing acrylic-resin 2mm below the CEJ. After storage (24h), the samples were fixed at a 45º angle to a metal funneled tip that applied a force on the lingual surface (0.5mm/min). Statistics were performed using analysis of variance and Tukey`s test (5%). **Results:** The flexural mean values (MPa) were: G1 - 206.52, G2 - 224.39 and G3 – 272.64, showing a statistically difference between the reinforcement materials used, with G3 presenting statistically higher flexural strength compared to other groups. For fracture resistance, mean values (Kgf) were: G1 – 47.45, G2 – 66.57 and G3 – 74.11, showing that G1 presented a statistically lower mean value than the other groups. **Conclusion:** Therefore, it was possible to conclude that glass fiber post, associated with accessory posts, is the method of choice for reinforcing structurally weakened roots.

Cardoso, P.E., Valera, M.C., Oliveira, L.D., Camargo, C.H.R Carvalho, C.A.T**. Fracture resistance of endodontically treated immature roots after different reinforcements.** *J Dent Res. Vol 90 (Spec. Iss. A) Abstract # 3103, 2011 (www.dentalresearch.org)*

Objectives: This study evaluated fracture resistance of brittleness bovine teeth simulating immature teeth, that received different reinforcements within radicular canal. This evaluation was made in comparison to teeth without reinforcements within radicular canal and teeth no brittleness. **Methods:** For that purpose, seventy bovine mandibular incisors were selected; of these, 56 were internally prepared, and then to simulating immature roots, were enlarged with Gates-Glidden, fast steel and videa burs. The specimens were distributed into five groups (n= 14): a) carbon fiber post and three accessory glass fiber posts; b) carbon/glass post and three accessory glass fiber posts; c) composite resin reinforcement; d) without reinforcement and e) without canal preparation and without reinforcement . The specimens were submitted to the fracture resistance testing with application of tangential compressive loading at an angle of 45º, at a speed equivalent to 1mm/min until the fracture using EMIC machine. **Results:** Results were subjected to statistical analysis (Tukey, t student and Dunnet), at a significance level of 5%. Results indicated statistically significant differences ($p <0,05$) in relation to root conditions. G1 presented higher resistance in comparison with other groups and G4 presented smaller resistance. **Conclusion:** It could be ended like this that the use of intra-radiculars reinforcements with different posts or resins composite increased fracture resistance of brittleness teeth under compression force.

Clavijo, V.G, Reis, JM, Kabbach, W, Silva, AL, Oliveira Junior, OB, Andrade, MF. **Fracture strength of flared bovine roots restored with different intraradicular posts**. *J Appl Oral Sci. 2009 Nov-Dec;17(6):574-8.*

Objective: The aim of this study was to evaluate the fracture strength and failure mode of flared bovine roots restored with different intraradicular posts. **Methods:** Fifty bovine incisors with similar dimensions were selected and their roots were flared until 1.0 mm of dentin wall remained. Next, the roots were allocated into five groups (n=10): GI- cast metal post-and-core; GII- fiber posts plus accessory fiber posts; GIII- direct anatomic post; GIV- indirect anatomic post and GV- control (specimens without intraradicular post). A polyether impression material was used to simulate the periodontal ligament. After periodontal ligament simulation, the specimens were subjected to a compressive load at a crosshead speed of 0.5 mm/min in a servo-hydraulic testing machine (MTS 810) applied at 135 masculine to the long axis of the tooth until failure. The data (N) were subjected to ANOVA and Tukey's post-hoc test (alpha=0.05). **Results:** GI and GIV presented higher fracture strength ($p<0.05$) than GII. GIII presented intermediate values without statistically significant differences ($p>0.05$) from GI, GII and GIV. Control specimens (GV) produced the lowest fracture strength mean values ($p<0.05$). Despite obtaining the highest mean value, GI presented 100% of unfavorable failures. GII presented 20% of unfavorable failures. GIII, GIV and GV presented only favorable failures. **Conclusions:** Although further in vitro and in vivo studies are necessary, the results of this study showed that the use of direct and indirect anatomic posts in flared roots could be an alternative to cast metal post-and-core. **PDF**

Costa, R.G.,Morais, E.C.C. Moreira-Da-Silva, S.M.L. Michel, M.D., Gonzaga, C.C.,Correr G.M. Bindo, M.J.F., Campos,E.A., **Fatigue and fracture resistance of customized fiber dowel**. *J Dent Res. Vol 90 (Spec. Iss.A) Abstract # 3103, 2011 (www.dentalresearch.org)*

Objectives: The aim of this study was to evaluate the root fracture strength of human unirradicular premolars restored with customized fiberglass dowel-core systems after fatigue simulation. **Methods:** Forty premolars with standard dimensions were chosen, cleaned, and stored in 0.5% chloramine T. The crowns were cut and the root length was standardized to 13 mm. The teeth were endodontically treated and embedded in acrylic resin. The specimens were distributed into 4 groups (n = 10) according to the restorative material used: G1 (prefabricated fiber post), G2 (prefabricated fiber post + accessory fiber posts), G3 (prefabricated fiber post + unidirectional fiberglass), and G4 (unidirectional fiberglass customized post). All posts were luted using resin cement and the cores were build-up with a composite resin, following manufacturer instructions. The samples were stored for 24 hours at 37°C and 100% relative humidity and then submitted to mechanical cycling (250.000 cycles with 30 N at a frequency of 2 Hz). The specimens were then compressive-loaded in a universal testing machine with a 3000 N load cell at a crosshead speed of 0,5 mm/min until fracture. The failure patterns were analyzed and classified. Data was submitted to statistical analysis (one-way ANOVA and Tukey's test) at a significance level of 5%. Descriptive analysis was used to assess the failure pattern. **Results:** The mean values of maximum load (N) were: G1 - 811,4 ± 124,3; G2 - 729,2 ± 157,2; G3 - 747,5 ± 204,7; G4 - 762,4 ± 110. Statistical differences were not observed among the groups. G1 showed more catastrophic failures than the other groups. G2, G3, and G4 showed 100% non-catastrophic failures. **Conclusions:** It can be concluded that dowel-core techniques do not interfere with the fracture strength of the tooth/dowel/core system; conversely, customized posts showed reversible and favorable type of failures.

Costa, RG, De Morais, EC, Campos, EA, Michel, MD, Gonzaga, CC, Correr, GM. **Customized fiber glass posts. Fatigue and fracture resistance.** Am J Dent. 2012 Feb;25(1):35-8

Purpose: To evaluate the root fracture strength of human single-rooted premolars restored with customized fiberglass post-core systems after fatigue simulation. **Methods:** 40 human premolars had their crowns cut and the root length was standardized to 13 mm. The teeth were endodontically treated and embedded in acrylic resin. The specimens were distributed into four groups (n=10) according to the restorative material used: prefabricated fiber post (PFP), PFP+accessory fiber posts (PFPa), PFP+unidirectional fiberglass (PFPf), and unidirectional fiberglass customized post (CP). All posts were luted using resin cement and the cores were built up with a resin composite. The samples were stored for 24 hours at 37 degrees C and 100% relative humidity and then submitted to mechanical cycling. The specimens were then compressive-loaded in a universal testing machine at a crosshead speed of 0.5 mm/minute until fracture. The failure patterns were analyzed and classified. Data was submitted to one-way ANOVA and Tukey's test (alpha = 0.05). **Results:** The mean values of maximum load (N) were: PFP - 811.4 +/- 124.3; PFPa - 729.2 +/- 157.2; PFPf- 747.5 +/- 204.7; CP - 762.4 +/- 110. Statistical differences were not observed among the groups. All groups showed favorable restorable failures. Fiberglass customized post did not show improved fracture resistance or differences in failure patterns when compared to prefabricated glass fiber posts. **PDF**

Costa, RG, de Morais, EC, Leão, MP, Bindo, MJ, Campos, EA, Correr, GM. **Three-year follow up of customized glass fiber esthetic posts.** *Eur J Dent. 2011 Jan;5(1):107-12.*

Customized glass fiber posts that is well adjusted into the root canal and have mechanical properties similar to those of dentin may be a suitable treatment for severely compromised endodontically treated teeth. This article reports a 3-year follow up of severely damaged endodontically treated teeth restored with unidirectional fiber glass customized post and core system instead of a conventional fiber post. The fabrication of this glass fiber customized post is a simple technique, providing an increased volume of fibers into the root canal, and an adequate polymerization of the post-core system. Over a three-year period, the treatments

demonstrated good clinical and radiographic characteristics, with no fracture or loss of the post and/or crown. This technique can be considered effective, less invasive, and suitable for restore endodontically treated teeth. **PDF**

da Silva GR, Santos-Filho, PC, Simamoto-Júnior, PC, Martins, L,R, Mota, A,S,, Soares, C.J. **Effect of post type and restorative techniques on the strain and fracture resistance of flared incisor roots**. *Braz Dent J. 2011;22(3):230-7.*

Restoring flared endodontically treated teeth continues to be a challenge for clinicians. This study evaluated the effect of post types and restorative techniques on the strain, fracture resistance, and fracture mode of incisors with weakened roots. One hundred five endodontically treated bovine incisors roots (15 mm) were divided into 7 groups (n=15). The two control groups were (C) intact roots restored with Cpc (cast posts and core) or Gfp (glass fiber posts). The five experimental groups were (F) flared roots restored with GfpAp (Gfp associated with accessory glass fiber posts), GfpRc (anatomic Gfp, relined with composite resin), and GfpRcAp (anatomized Gfp with resin and accessory glass fiber posts). All teeth were restored with metal crowns. Mechanical fatigue was performed with 3x10(5)/50 N. Specimens were loaded at 45º, and the strain values (μS) were obtained on root buccal and proximal surfaces. Following that, the fracture resistance (N) was measured. One-way ANOVA and Tukey's HSD tests (α=0.05) were applied, and failure mode was checked. **Conclusions:** No significant difference in strain values among the groups was found. Cpc presented lower fracture resistance and more catastrophic failures in flared roots. Gfp associated with composite resin or accessory glass fiber posts seems to be an effective method to improve the biomechanical behavior of flared roots. **PDF**

Deliperi, S. **Direct Fiber-reinforced Composite Restoration in an Endodontically-treated Molar: A Three-year Case Report**.*Operative Dentistry, 2008 33-2, 209-214.*

The proper utilization of fiber-reinforced resin composite restorations in endodontically-treated molars may preclude the use of more extensive restorative treatment, possibly delaying the need for expensive indirect restorations.The reconstruction of structurally-compromised non-vital posterior teeth may represent one of the most challenging adhesive-based restorative procedures. Several factors may influence the longevity of direct fiber -reinforced resin composite restorations: endodontic procedures prior to post cementation, dentin and/or post surface treatments, selection of the appropriate post design and architecture, resin composite polymerization and layering techniques. Thus, different specialties, such as endodontics and restorative dentistry, should work as a team to improve the longevity of restorations. This article presents three -year clinical results following reconstruction of a severely damaged endodontically- treated molar using direct fiber reinforced resin composite systems. **PDF**

Erkut , S., Gulsahi, K., Caglar, A., Imirzalioglu, P., Karbhari, VM, Ozmen, I. **Microleakage in over-flared root canals restored with different fiber reinforced dowels.** *Operative Dentistry, 2008, 33-1, 96-105*

Based on the in vitro results of this study, restoration of a tooth with an overflared root canal, using individually shaped polyethylene reinforced dowels, may help to reduce microleakage. This study evaluated microleakage in overflared root canals restored with four different types of adhesively-luted fiber-reinforced dowels: DT Light Post (LP), Glassix (GL), Ribbond (RB) and StickTech Post (ST). Forty non-carious, single- rooted mandibular human premolars with straight root canals were prepared using a step- back technique and obturated with gutta-percha using lateral condensation. The restored roots were randomly divided into four groups (n=10). The root canals were over-prepared, creating an over-flared dowel space, and each dowel was adhesively luted using a total-etched adhesive (Single Bond) and dual-polymerizing luting agent (RelyX ARC). All specimens were thermal cycled 1000 times between 5°C and 55°C and stored in 2% methylene-blue solution for one week. The teeth were cut horizontally into three consecutive sections: apical (A), middle (M) and coronal (C). Each section was digitally photographed from the occlusal direction under a stereomicroscope. The images were transferred to a PC and stored in TIFF format. For each image, dye penetration was estimated as the ratio of methylene-blue–infiltrated surface divided by total dentin surfaces. The data were compared and statistically analyzed using the Kruskal-Wallis test ($p<.05$). The Mann-Whitney U test was used to compute multiple pairwise comparisons to determine differences between the experimental groups ($p=.083$). Dentin-luting agent fiber-reinforced dowel (FRD) interfaces were evaluated under a scanning electron micro- scope. Scanning electron microscopy (SEM) showed detachment of the luting resin from the dentin surface in varying degrees in all specimens evaluated. All groups showed considerable leakage at the sections evaluated. Significant differences were demonstrated between LP-RB for the apical and middle sections and between GL- RB, LP-RB and ST-RB for the coronal sections ($p<.0083$). Among the FRDs evaluated, the individually shaped polyethylene-reinforced dowel (Ribbond) showed the least overall leakage. **PDF**

Fathi, M., Mortazavi, V., Katiraie, N**., Fracture resistance of endodontically treated teeth restored with esthetic posts**. *J Dent Res. Vol 87 (Spec. Iss. A) Abstract #1857 (www.dentalresearch.org)*

Objectives: This study compared the effect of three esthetic post systems with different modulus of elasticity on the fracture resistance and fracture patterns of endodontically treated teeth with structurally compromised and normal roots. **Methods:** Forty five extracted and root canal treated central incisors were assigned to 2 main experimental groups called "narrow" and "flared" canals. Narrow-canal group divided into 2 and flared-canal group, divided into 3 experimental subgroups (n=9). For narrow-canal subgroups, post spaces were prepared with the corresponding drills to restore with quartz fiber double taper light posts (D.T. LightPost; RTD) [subgroup A] and zirconia posts (CosmoPost;Ivoclar) [subgroup B]. For the flared-canal subgroups, thin–walled

canals were simulated, and restored with quartz fiber double taper light posts[subgroup C], quartz fiber double taper light posts inserted within the polyethylene woven fibers (Ribbond;Ribbond,Inc) [subgroup D] and zirconia posts[subgroup E]. All posts were cemented with dual–polymerizing adhesive resin cement (Panavia F; Kuraray).After restoration of access cavity with composite and thermocycling, compressive load was applied to the palatal surface of tooth until fracture. Mean failure load values were analyzed using One-way ANOVA and Tukey test (P<0.05).Mode of failure was evaluated with Fisher exact test (P<0.05). **Results:** The mean failure loads ± SD were 678.55±90.86, 603.44±68.66, 638.22±93.71, 732.44±81.78, and 573.66±91.340 N for subgroups A to E, respectively. Subgroup D exhibited significantly higher resistance to fracture compared to subgroups B, C and E (P<0.05). Subgroup E showed significantly less fracture resistance compared to subgroups A and D (P<0.05). Subgroups B and E showed more root fracture compared to subgroups A, C, and D (P=0,004). **Conclusion:** Significantly higher fracture resistance was observed in flared root canal treated teeth restored with quartz fiber double taper light posts + polyethylene woven fibers. Zirconia posts showed lower fracture resistance and significantly more root fracture compared to fiber posts.

Gomes, GM, Rickli, EH., Gomes, OMM, Rezende, EC, Gomes, JC, Loguercio, AD, Reis, A. **Fracture strength of bonded fiber-post techniques to flared roots.** *J Dent Res.Vol 92 (Spec Iss A) Abstract #1852, 2013 (www.dentalresearch.org)*

Objectives: The aim of this study was to evaluate the effect of alternative techniques to improve the adaptation of pre-fabricated fiber posts (FP) to oversized dowel spaces on the tooth fracture resistance (FR) of metal-free restorations after mechanical fatigue (MF). **Methods:** The root canals of 24 single-rooted mandibular premolars were prepared, and they were randomly divided into 4 groups. In groups GPC (positive control), the root canal was prepared with a drill compatible with the FP # 0.5 (Whitepost DC, FGM). In groups GNC (negative control), GAP (accessories posts) and GAD (anatomical direct post), oversized root canals were prepared and the FP # 0.5 were cemented without any additional technique (GNC), with accessories post (GAP) and after individualization of the FB with a composite resin (GAD). The luting procedures were performed with the adhesive Excite DSC and the resin cement Variolink II (Ivoclar Vivadent) according to the manufacturer's recommendations. Metal-free crowns were cemented on composite resin cores, the periodontal ligament was simulated and the specimens were submitted to MF (1.2 X 10^6 cycles, 30 N) followed by FR test at a compressive load (0.5 mm/min). The data were subjected to one-way ANOVA and Tukey's tests (α = 0.05). **Results:** The means and standard deviations of FR (N) for each group were: GPC: 1024.1±26.5, GNC: 740.8±126.2, GAP: 1051.9±200.6 and GAD: 785.5±17.0. The highest FR values were observed for GPC and GAP ($p < 0.0001$), which were similar one another. **Conclusion:** To improve the fracture resistance of metal-free crowns bonded to oversized root canals, it is advisable to use prefabricated fiber posts in combination with accessories posts.

Gomes, GM, Gomes, OM, Gomes, JC, Loguercio AD, Calixto AL, Reis A. **Evaluation of different restorative techniques for filling flared root canals: fracture resistance and bond strength after mechanical fatigue**. *J Adhes Dent. 2014 Jun;16(3):267-76. doi: 10.3290/j.jad.a31940.*

PURPOSE: To evaluate the fracture resistance (FR) and bond strength (BS) after mechanical fatigue (MF) of flared root canals restored with different restorative techniques for fiber post cementation. MATERIALS AND METHODS: The root canals of 84 single-rooted premolars were endodontically treated and prepared in order to simulate an oversized root canal, except for the positive control group (PC), in which a prefabricated fiber post (PFP) with a diameter compatible with the post cavity was cemented. In the oversized root canals, alternative restorative techniques for post cementation were tested, as follows: NC: negative control (PFP with a diameter smaller than that of the root canal); AP: PFP + accessory posts; RR: root reinforcement with composite resin; DAP: direct anatomical post; IAP: indirect anatomical post. After the luting procedures using Excite DSC and Variolink II, indirect composite crowns were cemented on composite resin cores and the specimens were mechanically fatigued (1.2 x 106 cycles, 40 N). From each group, 8 specimens were subjected to the push-out BS test and the others 6 specimens to the FR test. For both tests, the data were subjected to ANOVA and Scheffe's tests (α = 0.05) RESULTS: In terms of FR, all alternative techniques showed intermediate performance, being similar to both control groups. In terms of BS, only the groups DAP and IAP were similar to the well-adapted condition (positive control group). CONCLUSION: The use of DAP and IAP should be the first choice for fiber post cementation in oversized root canals.

Grandini, S, Goracci, C, Monticelli, F, Borracchini, A, Ferrar,i M. **SEM evaluation of the cement layer thickness after luting two different posts.** *J Adhes Dent. 2005 Autumn;7(3):235-40.*

Purpose: To verify with SEM the cement layer thickness and uniformity of resin-relined translucent fiber posts (anatomic posts) and standard translucent fiber posts. **Methods:** On 20 extracted maxillary anterior teeth, the roots were endodontically treated and prepared for the insertion of a fiber post. Translucent fiber posts (DT) were luted with a dual-curing resin cement (Duo-Link) in 10 specimens (group 1) after the canal walls had been treated with the One-Step bonding system. In the other 10 specimens (group 2), experimental anatomic posts (Anatomic Post'n Core, RTD St Egreve, France) were tested. To these posts, a layer of light-curing resin is added to allow for a pre-cementation relining of the post, aimed at improving its fit into the endodontic space. For luting, the same adhesive-resin cement combination of group 1 was used. All the roots were sectioned and prepared for SEM observations. At the 1-mm, 4.5-mm, and 8-mm level of each root, cement thickness was measured, and the presence of gaps or voids within the luting material or at its interfaces was evaluated. A statistical analysis was performed to test the significance of differences in the cement layer thickness around the two types of post and at different levels of the same type of post. **Results:** In

the presence of anatomic posts, the cement layer was significantly thinner and more uniform at the coronal and middle level of the root. In both groups, voids and bubbles were detected within the luting material, within the abutment material, and between fiber post and cement. Gaps were also visible between post and relining material. **Conclusions:** The resin cement thickness was significantly lower in the anatomic post group than in the control group (standardized posts), except at the apical third of the canal, where there was no statistically significant difference. A good adaptation of anatomic posts was evident in all of the specimens. **PDF**

Jimenez, M. P., Yaman, P., Dennison, J.D., et al **Fracture resistance of endodontically treated teeth restored with composite posts.** *J Dent Res. Vol 81 (Spec. Iss. A) Abstract #0323, 2002 (www.dentalresearch.org).*

The most recent application of fiber-reinforced composites involves their use as post and core systems to restore endodontically treated teeth. Even though this last application has been advertised and been used clinically by many dentists, there is very little information regarding the physical properties of these posts. Objectives: The purpose of this study was to compare the fracture resistance and mode of failure of endodontically treated teeth restored with fiber-reinforced composite posts. Methods: Ninety maxillary central incisors were divided into eight experimental groups and one control group of 10 samples each. Teeth from the two experimental groups called "Narrow" and "Flared" canals were restored with Fibre-Kor, Lucent Anchors and Ribbond posts using two different cementation techniques. Specimens were loaded to failure using an Instron machine. Results: Statistical analysis using two-way ANOVA revealed no significant difference between flared and narrow canals in mean load to failure between the post systems except for the Ribbond posts. For the narrow canal, the mean load ranged from a low of 4.55 (±1.49) Kg for the Ribbond Standard to a high of 12.9 (±1.64) Kg for the Lucent Anchors while for the flared canal the low mean was 9.04 (±1.76) for Fibre-Kor and the high of 12.87 Kg was equal for both Lucent Anchors and Ribbond Standard. Overall, the ParaPost control group had the highest load value (18.33 ±3.27 Kg). No root fractures occurred in any of the experimental groups. Conclusions: Results from the study suggest that the mode of failure or deflection of the fiber reinforced composite posts is protective to the remaining tooth structure. Considering the high risk of fracture and the possibility of re-treatment of endodontically treated teeth, the use of these new post systems seems to represent a conservative option when restoring debilitated root canals.

Jindal, S., Jindal, R, Mahajan, S, Dua, R, Jain, N, Sharma, S. **In vitro evaluation of the effect of post system and length on the fracture resistance of endodontically treated human anterior teeth.** Clin Oral Investig. 2012 Jan 14. [Epub ahead of print]

Objectives: The aim of this study was to evaluate the effect of post system and length on the fracture resistance of endodontically treated human anterior teeth. Methods: Seventy-five extracted human incisors were endodontically treated, out of which 60 were de-coronated 2 mm above the cemento-enamel junction and divided into two experimental groups based on the type of post system to be used: glass fiber post (GFP) and Ribbond fiber post groups (RFP). Endodontically treated human anterior teeth in which no post was placed served as control group. Each group was divided into two subgroups according to the length of post space: 5 and 10 mm and all the samples were restored with metal crowns. The fracture resistance was measured by applying loads at an angle of 130° to the long axis of teeth in an Instron universal testing machine. Results: The results revealed that GFP group at 10-mm post space length showed the significantly highest fracture resistance (740.2133 N) among all groups and subgroups. Decrease in post length resulted in the decrease in fracture resistance in GFP group (425.1867 N), whereas in group RFP 5-mm subgroup (299.6200 N) showed significantly higher fracture resistance than 10-mm subgroup (216.9300 N) but lesser than the control (437.8733 N) in both the subgroups. Conclusions: Glass fiber posts efficiently increase the fracture resistance of an endodontically treated tooth but the determination of optimal postlength is also essential. The present investigation highlights the significance of using glass fiber posts in the restoration of endodontically treated teeth. Endodontically treated teeth restored with glass fiber posts showed increased fracture strength and favorable mode of fracture, and are therefore highly recommended to achieve better clinical outcomes. **PDF**

Kalkan, M., Usumez, A., Ozturk, N., Belli, S.,Eskitascioglu, G. **Bond strength between root dentin and three glass-fiber post systems** *J Prosthet Dent 2006;96:41-6.*

Statement of problem. Glass-fiber posts were introduced for use after endodontic therapy instead of metal alloy and ceramic posts. There are several new types of glass-fiber post systems available, but little is known about how well these posts bond to the root surface. Purpose. The purpose of this in vitro study was to compare the bond strengths of 3 different types of glass- fiber post systems—opaque, translucent, and electrical glass—in 3 different locations of prepared post spaces. Material and methods. Sixty human intact single-rooted extracted teeth were used. The root canals were prepared using a step-back technique and obturated with gutta-percha using lateral condensation. The roots were divided into 3 experimental groups and further divided into 2 subgroups according to testing time (n=10). Roots were restored with 1 of the following post systems according to the manufacturer's instructions: opaque glass–fiber posts (Snowpost), translucent glass–fiber posts (FiberMaster), and electrical glass–fiber posts (Everstick). A self-etching primer (Clearfil Liner Bond) was applied to the walls of the post spaces, allowed to etch for 30 seconds, and gently air dried. A dual-polymerized bonding agent (Clearfil Liner Bond, Bond A and B) was then applied to the same walls. A dual-polymerizing resin luting agent (Panavia F) was mixed for 20 seconds and then placed in the post spaces using a lentulo spiral instrument. The roots were placed in light-protected cylinders; then the light source was placed directly on the flat cervical tooth surfaces and the cement was polymerized. Specimens were stored in light-proof boxes for 24 hours or 1 week after

the polymerization procedure. Each root was cut horizontally, and six 1-mm-thick root segments (2 apical, 2 middle, and 2 cervical) were prepared.Using a push-out test, the bond strength between post and dentin was measured after 24 hours or 1 week using a universal testing machine. Statistical analysis was performed with 3-way ANOVA followed by independent t tests (a=.05) to detect differences between groups defined by the specific interacting variables. The different combinations of posts and luting material from the cervical segments were analyzed with SEM. Results. The 3-way ANOVA indicated that push-out test values varied significantly according to the post system used (opaque, electrical, and translucent) (P,.01); the root segments (cervical, middle, and apical) (P,.01), how- ever, did not vary statistically according to the time of testing (24 hours and 1 week). Opaque and electrical glass– fiber posts showed higher bond strength values than translucent posts (P,.01). Push-out bond strength values of cervical segments were significantly higher than the middle and apical segments in translucent and electrical glass– fiber post groups (P,.01). In the opaque glass–fiber post group, there were no significant differences between cervical and middle segments. In SEM analysis, a distinct hybrid zone with long, numerous resin tags located between luting material and dentin was exhibited in all post systems. Conclusion. The opaque and electrical glass–fiber posts exhibited similar bond strengths, and translucent posts exhibited the lowest bond strength. The highest bond strength was observed in the cervical third of the post spaces for translucent and electrical glass–fiber post groups.

Kececi , A.D., Ureyen Kaya, B, Adanir, N. **Micro push-out bond strengths of four fiber-reinforced composite post system and 2 luting materials**. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008 Jan;105(1):121-8*

Objectives: The aim of this study was to compare the bond strengths of 2 types of dual-cured luting agents used for cementation of 4 different fiber-reinforced composite (FRC) posts by using a push-out test and to evaluate the failure modes of these systems. **Methods:** Eighty human maxillary central incisors were divided into 8 groups (n = 10), de-coronated, and roots filled and restored with one of the following post systems: groups 1 to 4: translucent quartz FRC posts; groups 5 and 6: opaque glass FRC post; and groups 7 and 8: individually formed electrical glass fiber post. Cementation was performed with 2 types of dual-polymerizing resin luting agents: Variolink II (groups 1, 3, 5, and 7) and a new self-adhesive resin cement, RelyX Unicem (groups 2, 4, 6, and 8). Slices with a thickness of 1.00 +/- 0.05 mm were prepared from the coronal third of each root by using a low-speed saw. Push-out tests were performed at a crosshead speed of 1 mm/min by using a universal testing machine, and the data was statistically analyzed (analysis of variance [ANOVA] and Duncan tests; P < .05). Fracture modes were evaluated at original magnification x40. **Results:** Micro push-out bond strengths were significantly affected by the type of luting agent and the type of post (P < .05, 2-way ANOVA). A significant difference was found among the groups (1-way ANOVA, P < .05). Fiber-reinforced composite posts luted with Variolink II showed higher bond strengths, and the groups ordered as 5, 1, 3, 7, 6, 2, 4, and 8, with the values (MPa, mean +/- SD): 13.80 +/- 5.00, 13.77 +/- 3.78, 12.20 +/- 4.79, 9.39 +/- 2.48, 9.21 +/- 7.76, 7.25 +/- 1.56, 3.89 +/- 4.41, and 3.77 +/- 1.20, respectively. Adhesive failures between dentin and cement were observed more than cohesive failures in cement or post. **Conclusions:** Push-out bond strengths can be affected by luting agent and post type. Variolink II and fiber post combinations resulted in high bond strength values. **PDF**

Kimmel SS. **Restoration and reinforcement of endodontically treated teeth with a polyethylene ribbon and prefabricated fiberglass post.** *Gen Dent. 2000 Nov-Dec;48(6):700-6.*

In the past it was considered appropriate to place a cast post and core in every pulpless tooth without regard to the remaining supportive tooth structure present. Recent research and the advent of adhesive bonding techniques have caused clinicians to reevaluate their restorative protocol. This article reviews the current literature with regard to restoration of the endodontically treated tooth and presents a method for restoration and reinforcement utilizing a combination of polyethylene ribbon and a prefabricated fiberglass post.

Kivanc, BH, et al. **Fracture resistance of thin-walled roots restored with different post systems.** *International Endodontic Journal, 42, 997–1003, 2009. doi:10.1111/j.1365-2591.2009.01609.x*

Aim: To compare the fracture resistance of thin-walled roots after restoration with different types of post systems. Methodology One hundred and sixty-five de-coronated maxillary central incisors were root filled and randomly assigned to three groups with respect to the remaining dentine thickness of root (1.0 mm, 1.5 mm, 2.0 mm). Each group was randomly divided into five equal subgroups. The subgroups were restored with one of the following post systems: polyethylene woven fibre (R), composite resin cured by light-transmitting post + glass fibre post (L), electrical glass fibre post (E), composite corono-radicular restoration (C) and cast metal post (M). Standard cores were constructed using composite resin in the first four groups. The samples were subjected to a gradually increasing force (1 mm min)1). The force required to fracture was recorded. The data was analysed with anova and Tukey test (P = 0.05). **Results:** The cast metal post group had the highest fracture strength (P < 0.001). There was no significant difference in fracture resistance between the other four groups. Fracture resistance was affected largely by the remaining dentine thickness in fibre post groups; how- ever, the difference was not significant. On the contrary in the cast metal post group load failure was inversely influenced by axio-proximal dimension of dentine walls. **Conclusion:** The cast post group had a higher fracture strength than resin groups. The force required to fracture the roots was similar for all fibre post systems and for all dentine thicknesses. **PDF**

Latempa, A.M.A, Almieda, S.A., Nunes, N.F., deSilva, E.M., Guimaraes, LJ.G.A. and Poskus, L.T. **Techniques for restoring enlarged canals: as evaluation of fracture resistance and bond strength.** International Endodontic Journal, doi:10.1111/jej. 12272, 2014 Wiley and Sons

Aim: To verify the influence of fiberglass post diameter, as well as the use of accessory posts on fracture resistance and bond strength, when used for restoring enlarged root canals. Methodology: 100 maxillary single rooted canine human teeth were decoronated and root canals were prepared using a number 4 drill (White Post, FGM). The roots were assigned into five groups (EC1) Post number 1 (Exacto Conical , Angelus, Londrina, PR Brazil); (EC2) post number 2, (DC3) post number 3 Exacto , (ECA) post number 1 Exacto +2 accessory posts and (WP) post number 4 (White Post, FGM). Posts 1-4 have a crescent diameter. Post were luted (Rely-X Arc, 3M ESPE, USA), and composite resin filling cores were prepared for the fracture resistance test (n =10). For the push out -test (n=10), roots were sectioned into one millimeter thick slices. Both tests were performed in the universal testing machine. Data were analyzed using ANOVA and Tukey's Test. Results: group's WP, and DC three, had higher fracture resistance than the other groups ($P < 0.05$), which were statistically similar. Root fractures occurred in 14% of the specimens. Group EC1 and IC2 had lower bond strength values and groups EC3 and ECA, which were lower than the WP group ($P < 0.05$). Conclusions: thicker posts were associated with higher resistance to fracture and bond strength through canals. Using a post +2 accessory post improved the bond strength but not the fracture resistance. **PDF**

Li Q, Xu B, Wang Y, Cai Y. **Effects of auxiliary fiber posts on endodontically treated teeth with flared canals.** *Oper Dent. 2011 Jul-Aug;36(4):380-9. Epub 2011 Aug 11.*

This study investigated the fracture resistance and retention of endodontically treated roots with over-flared canals restored with different post systems, including one cast metal post and four fiber posts with/without auxiliary fiber posts. One hundred endodontically treated incisor roots were experimentally flared using a tapered diamond bur. The roots were restored using one of the five post systems: Ni-Cr cast metal post (CM), D.T. Light glass fiber post (DT), Macro-Lock glass fiber post (ML), ML+2 Fibercone auxiliary fiber posts (2FC), and ML+5 Fibercone auxiliary fiber posts (5FC). After fabrication of the crowns, half of the specimens (n=50) were subjected to a fracture failure test-loading with an incremental static force at an angle of 45 degrees to the long axis of the root. The other 50 samples underwent a pull-out test. Fracture failure strength and pull-out strength were measured and analyzed using one-way analysis of variance (ANOVA) followed by Tukey's post hoc test ($\alpha=0.05$). After the tests were completed, all specimens displayed oblique root fractures or cracks, initiating from the palatal cervical margin and propagating in a labial-apical direction. The order of the fracture failure strength was as follows: 5FC=CM=2FC>ML>DT. Cast metal posts demonstrated the highest pull-out strength ($p<0.05$). No significant differences in pull-out strength were found in the ML, 2FC, and 5FC groups. **Conclusion:** Within the limitations of this study, it was concluded that the application of an auxiliary fiber post could significantly increase the fracture resistance of over-flared roots; however, no beneficial effects in enhancing retention were observed. **PDF**

Maceri, F, Martignoni, M, Vairo, G. **Optimal mechanical design of anatomical post-systems for endodontic restoration.** *Comput Methods Biomech Biomed Engin. 2008 Jul 16:1. [Epub ahead of print]*

This paper analyses the mechanical behaviour of a new reinforced anatomical post-systems (RAPS) for endodontic restoration. The composite restorative material (CRM) completely fills the root canal (as do the commonly used cast metal posts) and multiple prefabricated composite posts (PCPs) are employed as reinforcements. Numerical simulations based on 3D linearly elastic finite element models under parafunctional loads were performed in order to investigate the influence of the stiffness of the CRM and of the number of PCPs. Periodontal ligament effects were taken into account using a discretised anisotropic nonlinearly elastic spring system, and the full discrete model was validated by comparing the resulting stress fields with those obtained with conventional restorations (cast gold-alloy post, homogeneous anatomical post and cemented single PCP) and with the natural tooth. Analysis of the results shows that stresses at the cervical/middle region decrease as CRM stiffness increases and, for large and irregular root cavities that apical stress peaks disappear when multiple PCPs are used. Accordingly, from a mechanical point of view, an optimal RAPS will use multiple PCPs when CRM stiffness is equal to or at most twice that of the dentin. This restorative solution minimizes stress differences with respect to the natural tooth, mechanical inhomogeneities, stress concentrations on healthy tissues, volumes subject to shrinkage phenomena, fatigue effects and risks of both root fracture and adhesive/cohesive interfacial failure. **PDF**

Maceri, F, Martignoni, M, Vairo, G. **Mechanical behaviour of endodontic restorations with multiple prefabricated posts: a finite-element approach.** *J Biomech. 2007;40(11):2386-98. Epub 2007 Jan 24*

This paper investigates some mechanical aspects of a new endodontic restoration technique, based on the idea that the root cavity can be more efficiently filled if multiple prefabricated composite posts (PCP) are employed. Multi-post technique increases bearing capacity and durability of endodontically treated teeth, as shown by numerical simulations performed through three-dimensional elastic finite-element static analyses of a lower premolar, constrained by a non-linearly elastic spring system representing the periodontal ligament, under several parafunctional loads. The influence of PCPs' number, material and dimensions is investigated by comparison of the resulting stress fields with those obtained in cases of traditional restorations (cast metal post and ce-

mented single-PCP) and natural tooth, highlighting the advantages of the proposed technique when standard restorative materials are considered. A risk-analysis of root-fracture and interface-failure shows that cast gold-alloy post produces high stress concentrations at post-dentin interface, whereas multi-post solution leads to a behaviour closer to the natural tooth's, exhibiting some advantages with respect to single-PCP restorations. As a matter of fact, whenever PCPs' overall cross-section area increases, multi-post solution induces a significant reduction of stress levels into the residual dentin (and therefore the root-fracture-risk decreases) as well as of the expected polymerization shrinkage effects. Moreover, interfacial stress values in multi-post restorations can be higher than the single-PCP ones when carbon-fibre posts are considered. Nevertheless, the interfacial adhesive/cohesive failure-risk is certainly acceptable if glass-fibre posts are employed. **PDF**

Martelli, H Jr, Pellizzer, EP, Rosa, BT, Lopes, MB, Gonini, A. Jr. **Fracture resistance of structurally compromised root filled bovine teeth restored with accessory glass fibre posts.** *Int Endod J. 2008 Aug;41(8):685-92. Epub 2008 Jun 28.*

Aim: To evaluate the mechanical behaviour of structurally compromised root filled bovine roots after restoration with accessory glass fibre posts. **Method:** Fifty roots of bovine teeth received conventional post preparations with a cervical diameter of 3.5 mm. The roots were assigned to five groups (n = 10): group MP - cast metal post, group GP - glass fibre post and group AGP - glass fibre post plus accessory glass fibre posts. In groups GP-R and AGP-R (similar to groups GP and AGP), 2 mm of coronal tooth structure were left intact. All groups were subjected to an elastic limit assay and tested in an universal machine for fracture resistance. Repeated measures anova were performed to examine differences in fracture resistance; fracture modes were analysed by Fischer's exact test. **Results:** The mean fracture resistance values (kgf) were 61.8 (MP), 63.1 (GP), 55.5 (AGP), 56 (GP-R) and (53.1) AGP-R. No statistically significant difference was found between groups. The Fisher's exact test indicated significant differences ($P < 0.05$) in the fracture mode amongst groups MP, GP and AGP, indicating 100%, 50% and 10% of catastrophic fractures, respectively. **Conclusions:** The use of accessory glass fibre posts affected the fracture mode favorably: 90% of fractures in group AGP were in the coronal third. **PDF**

Moosavi, H, Maleknejad, F, Kimyai S. **Fracture resistance of endodontically-treated teeth restored using three root-reinforcement methods.** *J Contemp Dent Pract 2008 January; (9)1:030-037.*

Aim: The aim of this in vitro study was to compare the fracture resistance of endodontically-treated anterior teeth with their roots reinforced using three different restorative methods. **Methods and Materials:** Forty sound maxillary human central incisors were randomly assigned to four groups (n=10). The crowns of the teeth were removed at a level 2 mm incisal to the cementoenamel junction (CEJ). After root canal therapy, flared canals were simulated in three groups. In the first, second, and third groups the flared canals were reinforced with resin composite (RCO) (Clearfil DC Core Automix), two Reforpins (REF), and a resin cement (RCE) (Panavia F 2.0), respectively. In the fourth (DEN) group flared canals were not created. The same size fiber reinforced composite (FRC) posts were cemented with resin cement (Panavia F 2.0) in all groups. After post cementation and restoration of the teeth crown with a core build-up composite (Clearfil Photo Core), the roots of the teeth were embedded in acrylic resin blocks up to 1 mm below the CEJ. The samples were loaded in an Instron testing machine with a crosshead speed of 0.5 mm/min at a 45o angle to the long axis of the tooth on the palatal surfaces until failure occurred. Data were analyzed using the Kruskal-Wallis, Mann- Whitney, and Chi-square tests ($p=0.05$). **Results:** Significant differences were found between fracture resistance in all of the groups ($P<0.05$) with the exception being among the RCO and REF groups. The least mean value 230 (130) N and the highest mean value 830 (220) N were shown in the fracture resistance of the RCE and DEN groups, respectively. **Conclusion:** Reforpin can be used as an alternative to resin composite for internal reinforcement of weakened roots according to the results of this study. For reinforcement of flared canals, fiber posts along with Reforpin or resin composite proved to have higher fracture resistance than resin cement. Non flared canals had the highest fracture resistance. **PDF**

Porciani, P., Vano, M., Radovic, I, Goracci, C., Garcia-Godoy, F., Ferarri, M. **Fracture resistance of fiber posts: Combinations of several small posts vs standardized single post.** *Am J Dent 2008; 21: 373-376*

Purpose: To determine the fracture resistance of different sizes of standardized single fiber posts and the combinations of multiple small experimental posts. **Methods:** Single posts in 3 different sizes (1, 2 and 3 DT Light-Posts; RTD St Egreve, France) as control, and seven combinations of experimental small posts, reproducing the the sizes of several endodontic files were cemented in endodontic resin blocks. The combination of small posts were made combining 2-4 small posts so as to reach the the sizes of the standardized DT Light-Posts. The posts were loaded at an angle of 45degrees to the long axis of the block using a crosshead speed of 1 mm/min. until specimen failure. Ten posts/combinations were tested using one – way ANOVA., followed by Tamhane test for the *post hoc* comparison ($p<0.05$). **Results:** For the single posts, fracture resistance increased when increasing the diameter of the post. The use of multiple posts resulted in fracture resistance comparable to that of the single post in 2 of the 3 post diameters studied (DT1 and DT2). For the largest diameter studied (DT3), the use of multiple posts resulted in lower fracture resistances than did the single (DT3) post. **PDF**

Raposo, L.H.A. Silva, G. R., Santos-Filho, P.C.F., Soares, P.V., Soares, C.J. **Effect of posts and materials on flared teeth's mechanical behavior.** *J Dent Res. Vol 90 (Spec. Iss. A) Abstract #1862, 2011 (www.dentalresearch.org)*

Objectives: Assess the effect of different post systems and restorative techniques on stress-strain behavior and fracture resistance of flared roots. **Methods:** The coronary portion was removed from 105 bovine incisors, leaving a 15.0 mm root. After endodontic treatment samples were embedded in polystyrene resin and the periodontal ligament was simulated. The specimens were divided into 7 groups (n=15) and the roots of two reference groups were restored with cast post and core (CPC – G1) and fiber-glass post (FGP – G2). In the other groups, root canal were flared and restored with CPC (G3); FGP (G4); FGP and accessories FGP (G5); and FGP directly (G6) or indirectly (G7) rebased with accessories FGP and composite resin. All teeth were restored with all-metal crowns. Samples were submitted to mechanical fatigue (3x105 cycles of 50N). Strain-gauges were attached to the roots and strain values (μS) were obtained under a 100N load. Fracture resistance (N) was tested with a oblique load at a 0.5 mm/min cross-head speed. Data were analyzed with one-way ANOVA and Tukey HSD test ($p<0.05$). Failure mode was classified in accordance to the degree of dental structure destruction. Bi-dimensional finite element analysis was performed with representative models of each group, based on von Mises stress distribution criteria.Results: The results (N) were: G6- (867.9±198.1)a; G1- (859.9±199,2)a; G7- (847±112.2)a; G5- (842.7±174)a; G2- (627.1±119,8)b; G4- (625.3±164,3)b; G3- (620.2±164.2)b. There was no significant difference in the strains measured among groups, however, CPC increase catastrophic failures. Finite element analyses revealed higher stress concentration in CPC than in FGP, irrespective of restorative technique. **Conclusion:** Fiber-glass posts associated with composite resin or with accessory fiber-glass posts seem to be more indicated as alternative to cast post and core in flared roots, because of the lower risk of catastrophic failures and better stress distribution.

Rosa, R, Hwas, A, Melo, D, Valandro, LF, Kaizer, O. **Fracture strength of endodontically treated teeth restored with different strategies after mechanical cycling.** *Gen Dent. 2012 Mar-Apr;60(2):e62-8.*

The aim of this study was to analyze the fracture strength of endodontically treated teeth with different coronal restoration strategies after mechanical cycling. Thirty bovine teeth were randomly allocated into three groups (n = 10): Group 1, cast metal post and core; Group 2, glass fiber post with a composite resin core; Group 3, glass fiber post with a glass prefabricated core. For post cementation, an etch and rinse multistep adhesive system and resin cement were used. The specimens were submitted to mechanical cycling (106 cycles, 90 N, 4 Hz, 37 ± 1 degree C) and immediately loaded in a universal testing machine. The statistical analysis (one-way ANOVA) did not indicate a significant difference among the tested groups (Group 1 = 593.9 ± 128.7 N; Group 2 = 554.4 ± 213.3 N; Group 3 = 427 ± 104.8 N; P = 0.06). With regard to fracture patterns, all Group 1 specimens demonstrated catastrophic failures, while the specimens in Groups 2 and 3 demonstrated core or core/post failure. Despite the similar fracture strength observed in the tested groups, teeth restored with composite resin or glass prefabricated cores demonstrated favorable failure patterns compared to the cast metal post and core group. This study demonstrates that a glass prefabricated core can be an acceptable alternative for the reconstruction of endodontically treated teeth.

Saavedra, G.D.S.F.A., Zogheib, L., Komori, P.C.D.P., Borges, A.L.S. , TANGO, R.N., et al. **Resistance to compression of weakened roots submitted to root reconstruction.** *J Dent Res. Vol 90 (Spec. Iss. A) Abstract # 1121, 2011 (www.dentalresearch.org)*

Objective: This study evaluated, in vitro, the fracture resistance of human non-vital teeth restored with different reconstruction protocols. **Methods:** Forty human anterior roots of similar shape and dimensions were assigned to four groups (n=10), according to root reconstruction protocol: Group I (control): non weakened root with glass fiber post; Group II: root with resin composite by incremental technique and glass fiber post; Group III: root with accessory glass fiber posts and glass fiber post and Group IV: root with anatomic glass fiber post technique. Following post cementation and core reconstruction, the roots were embedded in chemically activated acrylic resin and submitted to fracture-resistance testing, with a compressive load at an angle of 45º in relation to the long axis of the root at a speed of 0.5 mm/min until fracture. All data were statistically analyzed with bilateral Dunnett test (5%). **Results:** Group I presented higher mean values of fracture resistance when compared to three experimental groups. Besides, the 3 experimental groups evaluated presented similar resistance to fracture when compared among them. None of the forms of root reconstruction with dental posts improved root strength, and the incremental technique was suggested as being the most recommendable, since the type of fracture that occurred allowed the dental remainder to be repaired. **Conclusion:** The results of this in vitro study suggest that the healthy remaining radicular dentin is more important to fracture resistance than the different root reconstruction protocols.

Salvio, L., Gonini,A. Jr. Moura, S.K.Chaves, MD. Lopes, MB **Resin cement and glass fibre accessories posts: photoelastic analysis.** *J Dent Res. 2009 Abstract 1840*

Objective: This study assessed the stress generated by resin cement on the walls of the prepared root with or without insertion of principal and/or accessory pre-fabricated glass fibre posts through photoelastic technique. Methods: The specimens were made of photoelastic resin discs with an inner orifice (2 mm*f*Ö and 4 mm height). The specimens were sandblasted with aluminum oxide and coated with an adhesive layer (Scotchbond Multi-purpose), and photoactivated by 20s. The specimens were divided into 5 groups (n=5) according to section of post used: Group 1 (G1) (control) - cement resin BiFix, Group 2 (G2) -one principal glass

fibre post (Reforpost), Group 3 (G3) - 1 principal and 2 accessory glass fibre posts (Reforpin) Group 4 (G4) -5 accessories posts. After polymerization the specimens were analysed and the visual representation of stress were measured through the program Imagetool using the isocromatic ring of order 1. The data were converted into MPa through a proper equation and the data submitted to ANOVA and Tukey's test (5%). Results: G1 (3.48 °" 0.23) did not differ from G2 (3.27 °" 0.26), but both differ from G3 (2.82 °" 0.14) and G4 (2.80 °" 0.18), which did not differ among each other. Conclusion: The inclusion of accessories posts can contribute to reducing the contraction stress on the walls of the root canals.

Singh, A, Logani, A, Shah, N. **An ex vivo comparative study on the retention of custom and prefabricated posts**. *J Conserv Dent. 2012 Apr;15(2):183-6.*

Aim: *This study was designed to comparatively evaluate the effect of cyclic loading on the retention of custom-fabricated fiber*-reinforced composite (CF-FRC), prefabricated metal, and glass fiber posts. Methods: Thirty mandibular first premolars decoronated at the CE junction were divided into three groups (n=10). Groups A, B, and C were restored using Para Post (Whale dent), Reforpost (Angelus), and CF-FRC post (Ribbond-THM), respectively. Five specimens from each group were subjected to cyclic loading. Tensile bond strength (TBS) was evaluated. **Results:** Pre-loading TBS values were statistically, significantly higher for all posts (P<0.05). Before and after loading, there was a significant difference between group C as compared to groups A and B. **Conclusions:** Cyclic loading reduced the retention of all posts but was comparatively lesser for the CF-FRC post. This system provides sufficient retention required for clinical success. **PDF**

Torabi, K., Fattahi, F. Fracture **resistance of endodontically treated teeth restored by different FRC posts: An in vitro study.** *Indian J Dent Res, 20(3), 2009 DOI: 10.4103/0970-9290.57359*

Background: Posts and cores are often required for restoration of pulpless teeth and to provide retention and resistance for a complete crown, but conventional posts may increase the root fracture. **Objective:** This study was performed to compare the root fracture resistance of extracted teeth treated with different fibers reinforced with composite posts and treated teeth with conventional post and core systems. **Methods:** Root canal therapy was performed for 50 mandibular first premolars. The coronal portion of each tooth was amputated, and five post and core systems (cast, polyethylene woven, glass, carbon, and quartz fiber posts) were compared. Acrylic resin blocks were used for mounting, using a layer of elastomeric impression material covering the roots. The load was applied axially and measured with a universal testing machine. **Results and Conclusion:** Significantly, cast posts and cores had a higher failure threshold including teeth fracture; whereas, fiber posts failure was due to core fracture, with or without fractures in coronal portion of posts. Difference in FRC posts did not provide any significant difference in the load failure and the mode of fracture. **PDF**

Usumez, A, Cobankara, FK, Ozturk, N, Eskitascioglu, G, Belli, S**. Microleakage of endodontically treated teeth with different dowel systems.** *J Prosthet Dent. 2004 Aug;92(2):163-9*

Statement of problem: Several new esthetic dowel systems are available for the restoration of endodontically treated teeth, but little is known about how effectively these dowels seal the restored teeth. **Purpose**: The purpose of this in vitro study was to compare microleakage of 3 esthetic, adhesively luted dowel systems with a conventional dowel system. **Methods:** The root canals of 41 human intact single-rooted extracted teeth were prepared using a step-back technique. The teeth were randomly divided into 4 experimental groups (n=10), and 1 tooth served as a positive control. The decoronated roots were obturated with gutta-percha using lateral condensation. Roots were restored with 1 of the following dowel systems according to the manufacturer's instructions: (1) stainless steel dowels (ParaPost), (2) glass fiber dowels (Snowpost), (3) resin-supported polyethylene fiber (Ribbond) dowels, or (4) zirconia dowels (Cosmopost). Using a fluid filtration method, coronal leakage of the specimens along the dowel space and root canal restorative material was measured. Fluid movement measurements were made at 2-minute intervals for 8 minutes to measure the presence of voids existing in the obturated canals, at 1 week, 3 months, and 6 months following dowel insertion. A repeated-measures analysis of variance (ANOVA) was used to analyze logarithmic transformations of data (time and dowel material) for significant differences. The Tukey HSD test and paired 2-tailed tests were used to perform multiple comparisons (alpha=.05). **Results**: The data indicated that the leakage values varied according to the dowel system used (P<.01). There was significant interaction between dowel systems and time of testing (P<.01). The sealing ability of zirconia dowels decreased over time (P<.01), but sealing abilities of stainless steel and resin-supported polyethylene fiber dowels remained constant (P>.05). The sealing ability of glass fiber dowels increased at 3 months (P=.032) and remained constant over the next 3 months (P=.758). Statistically, resin-supported polyethylene fiber and glass fiber dowels showed the lowest coronal leakage when compared with stainless steel and zirconia dowels at all time periods (P<.01). There were no significant differences between resin-supported polyethylene fiber and glass fiber dowels at any time period. The initial leakage measurement in zirconia dowel and stainless steel dowels were similar (P=.914), but became significantly different at 3 and 6 months (P<.01). **Conclusions:** Resin-supported polyethylene fiber dowels and glass fiber dowels tested exhibited less micro-leakage compared to zirconia dowel systems. The latter system should be further evaluated because of its unacceptable level of leakage. **PDF**

Zogheib, LV, Saavedra, Gde S, Cardoso, PE, Valera, MC, Araújo, MA. **Resistance to compression of weakened roots subjected to different root reconstruction protocols.** *J Appl Oral Sci. 2011 Nov-Dec;19(6):648-54.*

Objective: This study evaluated, in vitro, the fracture resistance of human non-vital teeth restored with different reconstruction protocols. **Methods:** Forty human anterior roots of similar shape and dimensions were assigned to four groups (n=10), according to the root reconstruction protocol: Group I (control): non-weakened roots with glass fiber post; Group II: roots with composite resin by incremental technique and glass fiber post; Group III: roots with accessory glass fiber posts and glass fiber post; and Group IV: roots with anatomic glass fiber post technique. Following post cementation and core reconstruction, the roots were embedded in chemically activated acrylic resin and submitted to fracture resistance testing, with a compressive load at an angle of 45º in relation to the long axis of the root at a speed of 0.5 mm/min until fracture. All data were statistically analyzed with bilateral Dunnett's test (α=0.05). **Results:** Group I presented higher mean values of fracture resistance when compared with the three experimental groups, which, in turn, presented similar resistance to fracture among each other. None of the techniques of root reconstruction with intraradicular posts improved root strength, and the incremental technique was suggested as being the most recommendable, since the type of fracture that occurred allowed the remaining dental structure to be repaired. **Conclusion**: The results of this in vitro study suggest that the healthy remaining radicular dentin is more important to increase fracture resistance than the root reconstruction protocol. **PDF**

PDF indicates that I have the complete study/article available as a PDF file.

Norman Hicks Consulting 2618 Taylorsville Rd. Taylorsville KY, 40071 USA 502-396-0997

nrmnhicks@yahoo.com