

HA017 Alternative methods for determining shrinkage in restorative resin composites

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Resin composites (Filtek Z250, Z350 and P90/3M ESPE, Esthet-X, TPH Spectrum/Dentsply 4 Seasons, Tetric Ceram/Ivoclar-Vivadent) polymerization shrinkage was evaluated by 3 different methods: coordinate measuring machine (CMM), optical coherence tomography (OCT) and the application of a well-known method, such as Archimedes Principle. The null hypothesis tested: (1) there are no differences between the materials tested; (2) there are no differences between the methods used for polymerization shrinkage measurements. For CMM measurements, specimens were made in a cylindrical Teflon mold (7x2 mm). The difference between the volume of the mold and the volume of the specimen was calculated. OCT evaluations were performed using cylindrical specimens (7x0.5mm). Images were obtained before and after photoactivation, and thickness variations were measured. Density variations were also registered and volumetric changes were measured using Archimedes Principle of buoyancy (n=5). Statistical analysis of the data was performed with one-way ANOVA, Games-Howell test and Pearson's Correlation. The results varied according to the method used. When methods were compared to Archimedes principle, a positive but regular correlation was found (CMM -0.57/ OCT -0.49).

Considering the variations in the results, reported values could only be used to compare materials within the same method. However, it is possible rank composites for shrinkage and to relate these data from different test methods. Furthermore, reduced polymerization shrinkage was found for silorane-based composites.

HA018 Evaluation of the microtensile critical testing parameters: laboratory and finite elements analysis

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Several modifications have been made in the microtensile methodology since its introduction. The aim of this study was to evaluate the effect of the microtensile critical testing parameters on bond strength, failure mode, and stress distribution of a conventional two-step adhesive system to human dentin. Third molars were ground to expose occlusal dentin, and after surface treatment with the adhesive system, composite resin restorations were constructed. Dumbbell and stick-shaped specimens were fabricated from the same teeth and divided into three groups: Di- Dircks' device with dumbbell-specimens; GeS- Geraldeli's device with stick-specimens and Superglue cyanoacrylate; GeZ- Geraldeli's device with stick-specimens and Zapit cyanoacrylate. Specimens were tested and microtensile bond strength determined. The failure mode was examined under stereomicroscopy, and fracture initiation sites were verified by scanning electron microscopy and energy dispersive spectroscopy. Three-dimensional models of each device and specimen were created and finite element analyses were performed (FEA). The bond strength values were (MPa): Di- 39.2±14.6; GeS- 36.8±13.6; GeZ- 35.7±13.6. More interfacial failures were observed on Di group (62.5%), followed by GeS (37.8%) and GeZ (19.4%). On FEA, more uniform stress distribution was observed at the cylindrical adhesive layer of the Di group specimen.

The type of device and specimen geometry did not influence the bond strength values; however, the failure mode and stress distribution of the specimens were affected by these parameters. (Apoio: FAPs - FAPEMIG)

HA019 Mechanical behavior of ceramic materials used for fixed partial dentures

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The objectives of this study were: a) to determine the flexural strength (σ_f), Weibull modulus (m), slow crack growth coefficient (n) and fracture toughness (K_{IC}) of ceramics used as framework for fixed partial dentures (FPDs) (YZ- yttria stabilized zirconia polycrystals; IZ- alumina-based zirconia-reinforced glass infiltrated ceramic; AL- alumina polycrystals) and two veneering materials (VM7 and VM9); b) to evaluate the effect of the specimen design in the σ_f and fracture mode (FM); c) to evaluate the influence of the material and mechanical cycling (MC) in the fracture load (FL) of FPDs; d) to relate the mechanical behavior of materials tested as bar-shaped (BS) and FPDs. BS (2mm x 4mm x 16mm) were tested for three point flexure and FPDs were loaded to fracture. Weibull analysis and dynamic fatigue were used to determine m and n, respectively. Eight FPDs of each group were subjected to MC and loaded to failure. Stress distribution was evaluated with finite element analysis. Fractography was used to determine FM and K_{IC} . Data were analyzed using Kruskal-Wallis and Tukey (95%). YZ showed the highest σ_f (860 MPa) followed by IZ and AL (~440 MPa). Except for IZ and VM7, m was similar among the materials. Higher n values were found for YZ (76) and AL (72). YZ presented the highest K_{IC} . σ_f was influenced by the material subjected to tension during testing. YZ FPDs presented higher FL. MC had no influence in the FL of FPDs. Good agreement was found between stress distribution and σ_f for BS and FPDs. Different FM were observed for BS and FPDs.

YZ presented the best mechanical performance in both BS and FPD configuration (Apoio: CNPq - 143061/2006-2)

HA020 Effect of Er:YAG laser used to cavity preparation on dentin demineralization around restorations

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The aim of this study was to evaluate the effect of cavity preparation with Er:YAG laser on dentin adjacent to restorations submitted to cariogenic challenge *in situ*, by subsurface microhardness analysis. Bovine incisors were sectioned, flattened and polished, resulting in 40 enamel slabs. The slabs were randomly assigned to four groups (n=10), according to the cavity preparation technique: I - high-speed handpiece (control); II - Er:YAG laser (160mJ; 3Hz); III - Er:YAG laser (260mJ; 3Hz); IV - Er:YAG laser (300mJ; 3Hz). Cavities were restored with composite resin, and the specimens were fixed in intra-oral appliances and worn by 10 volunteers for 14 days for simulating cariogenic challenge *in situ*. During the experimental period, 20% Sucrose solution was dripped over each specimen 6 times a day. Samples were removed, sectioned, and examined for subsurface Knoop microhardness at 100, 200, and 300 μ m from the restoration and at a 30 μ m from dentin surface. Split-plot analysis of variance showed no significant difference among the cavity preparation techniques (p=0.1129), among distances (p=0.9030), as well as no difference in the interaction between the main factors (p=0.7338).

It was concluded that the cavity preparation with Er:YAG laser did not influence on dentin microhardness submitted to cariogenic challenge *in situ*.

HA021 A digital image correlation analysis on the influence of prosthesis material on strain distribution of implant-supported crowns

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A digital image correlation (DIC) method for full-field surface strain measurement was used to analyze the effect on the strain distribution of two veneering materials for implant supported crowns. An epoxy resin model of a bone block was made with a combination of acrylic resin replicas of a mandibular first premolar and second molar and with threaded implants replacing the second premolar and first molar. Porcelain-veneered (G1 and G3) and resin-veneered (G2 and G4) screw-retained splinted crowns were fabricated and loaded with (G1 and G2) and without (G3 and G4) the presence of the second molar replica. A 2-dimensional DIC measuring system was used to record surface deformation of the bone block model at a frequency of 1.0Hz until a 250N load was reached. The following horizontal strains (exx, %) averaged over the length of the teeth or implants were found: between molars, G1 (0.13±0.02), G2 (0.09±0.02), G3 (0.14±0.03), G4 (0.12±0.03); between implants, G1 (0.12±0.03), G2 (0.07±0.03), G3 (0.13±0.02), G4 (0.08±0.02). The magnitude of strain in the simulated bone block with the resin-veneered crowns was lower than that with porcelain-veneered crowns, irrespective of the presence or absence of the second molar.

It was speculated that using the softer resin veneer helped to spread the load more evenly amongst the supporting teeth/implants, thus reducing the strains in the simulant bone block. Conversely, using the harder porcelain veneer resulted in the load being concentrated within one or two teeth/implants, thus leading to higher strain values in the bone block. (Apoio: FAPs - FAPESP - 2007/06955-3)

HA022 Effect of veneering materials, fit and retightening on preload of retention screw of implant-supported crowns after mechanical cycling

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Considering the occurrence of screw loosening as a mechanical failure, this study evaluated the effect of veneering material, fit and retightening on preload of retention screw of implant-supported crowns submitted to mechanical cycling. Four groups (n=12) were obtained: gold UCLA abutment veneered with ceramic (group GC) and resin (group GR), titanium UCLA abutment veneered with ceramic (group TC) and resin (group TR), and zirconia abutment veneered with ceramic (group ZC). The crowns were attached to external hexagon implants by gold retention screws with 35Ncm. Vertical loading of 50N was applied by mechanical cycling until 1x10⁶ cycles. Detorque values were obtained initially and after each period of 1x10⁶ cycles followed by retightening of the retention screw. Vertical misfit was measured before and after mechanical cycling. Data were submitted to ANOVA, Fisher's exact test, paired t test, Student's t-test and Pearson correlation (P<0.05). All detorque values were lower than 35Ncm. There was statistically significant difference (P<0.05) among the groups for the initial and final detorque means. There was difference (P<0.05) in detorque values of different cycling periods, except for Group GC. The titanium abutments showed the highest misfit but there was no significant correlation (P>0.05) between misfit and detorque.

Torque loss occurred regardless of abutment type and veneer material. Although titanium abutments showed the highest misfit, vertical misfit and retightening did not influence torque maintenance since screw loosening was not exhibited. (Apoio: FAPESP - 07/53140-3)

HA023 Biological properties of an antimicrobial monomer for application in prosthodontics

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This study evaluated the biological properties of methacryloyloxundecylpyridinium bromide (MUPB), an antiseptic monomer copolymerizable with acrylic resins. The minimum inhibitory and fungicidal/bactericidal concentrations (MIC, MFC/MBC) of MUPB were determined against the species *C. albicans* (Ca), *C. dubliniensis* (Cd), *C. glabrata* (Cg), *L. casei* (Lc), *S. aureus* (Sa) and *S. mutans* (Sm), in comparison with cetylpyridinium chloride (CPC). The cytotoxicity of MUPB was investigated in L929 cells, compared with methyl methacrylate (MMA). The antimicrobial activity of MUPB in different concentrations (0, 0.3% and 0.6% w/w) incorporated into an adhered polymerized denture base acrylic resin was evaluated by means of disk diffusion test, and the CFU/ml adhered to the AR after contact with suspensions of each microorganism were quantified. Significant difference was only found for Cd (P=.046) and Sm (P=.043), with MUPB presenting a lower MIC values than CPC. For MFC/MBC, significant difference was found only for Ca (P=.046). Non polymerized MUPB showed to be 20 times more cytotoxic than MMA. Irrespective of the concentration incorporated and the species, there was no growth of inhibition halo around the specimens. The incorporation of MUPB only influenced the adhesion of Ca (P=.003), with lower CFU counts for the 0.6% w/w group.

Non polymerized MUPB has an antimicrobial capacity close to that of CPC, and high cytotoxicity when compared to MMA. The antimicrobial activity of MUPB in its polymerized form didn't depend on its elution, but it was shown to be restricted to *C. albicans*.

HA024 Myofibroblasts promote oral squamous cell carcinoma cell proliferation, invasion and formation

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Myofibroblast, a specific cell characterized by the expression of a repertoire of growth factors, is frequently found in the stroma of oral squamous cell carcinomas (OSCC). Although its presence in the invasive tumor front is significantly associated with shorter survival, the exact influence of myofibroblasts on oral tumorigenesis remains unclear. The aim of this study was to analyze *in vitro* and *in vivo* the role of myofibroblasts on OSCC proliferation, invasion and formation. Fibroblast and myofibroblast cells from OSCC stromas were cloned, characterized and used to determine the influence of their released factors on tumor behavior. Myofibroblast-released factors significantly stimulated proliferation of OSCC cells, and significantly increased tumor invasion which was associated with elevated production of matrix metalloproteinases (MMP-1, -2, -9 and -13) by tumor cells compared to fibroblast-released factors. Injection of myofibroblast clones in association with OSCC cells promoted the development of significantly larger tumors, in a xenograft model, compared with fibroblast clones. To gain insight into the molecular mechanism by which myofibroblasts affect OSCC proliferation, we examined the gene expression profile of growth factors with a qRT-PCR array system. Five up-regulated and 6 down-regulated genes were identified among the cells, some of which are known to be important inducers of the cell cycle.

Our results suggest that myofibroblasts in the OSCC stroma promote cell proliferation and invasion, and a more aggressive tumor behavior. (Apoio: FAPs - Fapesp - 2007/03952-1)