Effect of Different Polishing Methods on Composite Surface Roughness

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AIM or PURPOSE: The aim of this study is to compare the effect of different finishing and polishing procedures on the surface roughness of a microhybrid composite resin material.

MATERIALS and METHOD: In the study, a tungsten carbide finishing bur, Sof-Lex composite finishing and polishing discs (3M), and Diapolisher diamond-containing polishing paste (GC) were used. Using Herculite Classic B1 composite resin (Kerr), 35 composite samples were prepared with metal molds of 3 mm depth and 3 mm diameter. The specimens were cured for 40 seconds with quartz halojen light curing unit for polymerization. The prepared samples were randomly divided into 5 groups. The first group served as the control group. Afterwards, the 2nd group received treatment with a finishing bur, the 3rd group with finishing and polishing discs, the 4th group with finishing bur and polishing discs, and the 5th group with finishing bur, polishing discs, and polishing paste. Surface roughness after polishing was measured at three different points using Surtronic 25 (Taylor-Hobson) and surface of one sample from each group was observed under a scanning electron microscope (SEM). The obtained data were analyzed using the Kruskal-Wallis test. Statistical significance level was established at $p<0.05$.

RESULTS: The highest roughness value (Ra) was observed in the control group obtained with transparent tape (0.19), while no significant difference was found among the statistical analysis of the polishing systems applied to the data. However, the highest Ra among the polishing systems was observed in the group treated only with polishing discs (0.50), while the lowest Ra was observed in the group treated with carbide bur, polishing discs, and polishing paste (0.63).

CONCLUSION(S): The surface roughness values of microhybrid composite resins did not show a significant difference after different finishing and polishing procedures.

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Fracture resistance of teeth restored with different bioactive restoratives

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AIM or PURPOSE: To evaluate the effect of different bioactive restorative materials in Class II MOD cavities in terms of fracture resistance.

MATERIALS and METHOD: A total of 70 extracted sound human premolar teeth were used for the study. After 10 teeth were kept intact as positive control(Group I), Class II MOD preparations were done with standardized dimensions. 10 prepared teeth without restoration were kept as negative control(Group II). Afterwards, the remaining 50 prepared teeth were randomly divided into five groups according to the restorative materials(n=10): Group III-bulk fill glass hybrid restorative material, Equia Forte HT; Group IV-giomer, Beautifil II; Group V:self-adhesive composite hybrid, Surefil One; Group VI: alkasite, Cention N, and Group VII:bulkfill composite, Tetric PowerFill. Following 48h water storage, each specimen was subjected to fracture resistance test with a cross head speed of 1 mm/min. Data were analyzed using one-way ANOVA followed by Tukey's post-hoc test ($p<0.05$).

RESULTS: The highest fracture resistance values were observed in Group VI(Cention N), Group VII (Tetric PowerFill) and Group IV(Beautifil II) respectively ($p>0.05$). Group III(Equia Forte HT) exhibited significantly lower fracture resistance than Groups IV, VI and VII whereas Group V (Surefil One) revealed significantly lower fracture resistance than Groups VI(Cention N) and VII(Tetric PowerFill)($p<0.05$). The lowest fracture resistance values were observed in Group III(Equia Forte HT) and Group V(Surefil One), without any significant difference between them($p>0.05$).

CONCLUSION(S): Among the tested bioactive restorative materials, the alkasite, bulkfill composite and giomer restoratives might be better choices in stress bearing MOD cavities because of their higher fracture resistance.

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Resin composite microhardness ratio: effect of light curing modes

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AIM or PURPOSE: The aim of this study was to evaluate the relationship of different intensities and modes of light curing units with the bottom/top microhardness ratio(VHR) in different composite resin types.

MATERIALS and METHOD: Three microhybrid (Myra & Pergamon (Dentac, Turkey), G-aenial posterior (GC Corp, Japan)) and two nanohybrid (Parion (Dentac, Turkey), Optishade Universal (Kerr Dental, USA)) composite resin (5.0 x 2.0 mm) distributed into five groups (n=10) according to the light-curing modes. Groups were formed as standard mode1000 mW/cm2 x 10 s), soft start mode 1600 mW/cm2 x 10 s), SoftStart pulse mode(1800 mW/cm2 x 10 s) and ortho mode(3000 mW/cm2 x 3 s) of VEGA (Dentac, Turkey) and VALO Cordless (Ultradent, USA) light curing unit in standard mode (1000 mW/cm2 x 10 s). The Vickers microhardness of each specimen was measured on the top and bottom surfaces and VHR value was obtained. The means were analyzed with 2-way ANOVA and Bonferroni correction was employed for multiple comparisons for the bottom/top ratio assessments.

RESULTS: According to the ANOVA results, RBC material, and light-curing mode significantly affected the hardness ratio values ($p<0.001$). The highest VHR value was obtained in GC Posterior with Vega soft start mode (88.7%). Parion nanohybrid composite showed an insufficient estimated depth of cure, with VHR in the range 54.8–77.3%. Adequate VHR value (>80%) was found in at least one light group from other tested composite materials.

CONCLUSION(S): The adequacy of VHR was demonstrated to be dependent not just on the composite type in addition on the light curing mode.

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Effect of smoking and finishing/polishing on roughness of nanohybrid-composite

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AIM or PURPOSE: To evaluate effect of conventional cigarette and heated tobacco product smoking and finishing/polishing protocol on surface roughness of a nanohybrid composite.

MATERIALS and METHOD: Thirty-six discs (6mm diameter/2mm thickness) fabricated from nanohybrid composite (Palfique LX5, Tokuyama, Japan) were assigned to 6 groups according to: tobacco product (conventional cigarette/LM, Philip Morris International Inc., Egypt; and heated tobacco/Heets, Russet, Philip Morris International Inc., Italy); and finishing/polishing protocol (control /discs cured against Mylar strip; finishing discs/Diamond Master Kit, FGM, Brazil; two-step polishing system/DIACOMP PLUS TWIST, EVE, Germany). Prior to finishing/polishing protocols, all specimens were wet ground with medium grit finishing stone (komet, Germany) as baseline. Following finishing/polishing, specimens were exposed to 600 cigarettes/Heets (20/day) equivalent to 30 days of medium smoking behavior. Surface roughness (Ra) before and after smoking was measured using JITAI8101 surface roughness tester (Beijing Jitai Tech Detection Device Co., China). Mean differences in surface roughness were analyzed using One-Way ANOVA/Tukey's and independent student t-test.

RESULTS: For cigarettes, change in Ra of control group was significantly higher than discs group. Change in Ra of polishing system group was statistically similar to that of control and discs groups. For heets, no significant difference in Ra between finishing/polishing groups. Within control group, no significant difference in Ra change of both smoking groups. Within discs and polishing system groups, change in Ra of cigarettes was significantly lower than Heets.

CONCLUSION(S): Heated tobacco product smoking resulted in increased surface roughness in composite compared to conventional cigarette smoking. Both finishing discs and two-step polishing systems produced comparable surface roughness.

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Effect of preheating composites with warm-airstream on bond strength

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AIM or PURPOSE: This study assessed the effect of preheating nano-hybrid and bulk-fill composites with warm airstream on their microtensile bond strength (MTBS) to dentin.

MATERIALS and METHOD: In this in vitro study, dentin was exposed in 42 extracted premolars that were assigned to two groups (n = 21) for bonding to EverX Posterior bulk-fill and Grandio nano-hybrid posterior composite. Each group was subdivided into three subgroups for preheating of composite to 50°C by a commercial composite warmer (Subgroup 1), a warm airstream by a hair dryer for 10 s (Subgroup 2), and no heating (room temperature; Subgroup 3). Composite cylinders with a 4-mm height were bonded to the tooth surface with a 5th-generation bonding agent using the incremental technique and cured (each increment for 30 s). The MTBS to dentin was measured, and the bonding interface was evaluated under a stereomicroscope and a scanning electron microscope (SEM).

RESULTS: In both composite groups, the mean MTBS of the warm airstream subgroup was significantly higher than that of warmer ($P < 0.001$) and control ($P < 0.001$) subgroups. The mean MTBS of the warmer subgroup was significantly lower than that of control subgroup ($P = 0.01$). The MTBS of the EverX composite was significantly higher than that of the Grandio composite only in the warmer group ($P < 0.05$). Adhesive failure occurred more frequently in all groups with the highest frequency in airstream subgroup of both composite types.

CONCLUSION(S): Preheating with a warm airstream significantly increased the MTBS of both composite types to dentin.

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Case Study - Accepted: Poster Presentation

Treatment of Endodontically Treated Teeth with Endocrown

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INTRODUCTION: Endocrowns are minimally invasive treatment options that provide retention without causing material loss in the root canals by taking advantage of the shape of the pulp chamber and advanced adhesive techniques. This case presents that endocrowns can be considered for restoration of severely damaged coronal hard tissue associated with an endodontically treated teeth.

CASE DESCRIPTION: A 25-year-old male patient, who was medically healthy, underwent root canal treatment for tooth 46 due to deep dentin caries and was referred to our clinic for restoration. After preparation we scanned the tooth using an intraoral scanner (Trios 5, 3Shape) and proceeded with the design using a DentalCAD (Exocad GmbH). We used a resin nanoceramic block (CERASMART 270 GC) as the material and