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HA007 — Nanoscale biomimetic mineralization of bioprinted gelatin methacryloyl for tissue engineering

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Não há conflito de interesse

Mimicking the complex structure of bone tissue is key for effective bone regeneration. This study aimed to develop a unique process to 3D bioprint microscale cell-laden scaffolds that mimic the bone nanoscale structure and function with precision and can be delivered via injection for minimally invasive regenerative procedures. Gelatin methacryloyl (GelMA) hydrogels were produced by stereolithography and used as an organic substrate for biomimetic nanoscale mineralization via a proprietary protein-mediated biomimetic mineralization process with osteopontin in a Ca^{2+} and PO_4^{3-} supersaturated media. Mineralization was optimized for different media, gelMA concentrations, and cross-linking times. The mineral content and mechanical properties were evaluated, and optimized hydrogels were used for dental pulp stem cells (DPSCs) encapsulation. The printability was tested for injectable mineralized microgels production. After the screening, 10wt% gelMA printed for 25s and mineralized in α-MEM was chosen, reaching an elastic modulus of 123.94kPa. Mineralized hydrogels DPSCs viability and differentiation. Injectable flower-shaped microgels (900μm) were successfully printed and mineralized.

The nanoscale mineralization of bone-like cell-laden bioprinted microgels was demonstrated for the first time. The obtained nanostructure evidence the ability of these materials to mimic the intra- and extracellular environments of bone. Mineralized microgels were successfully produced for injectable minimally invasive regenerative procedures.

HA008 — Color stability in relation to degree of conversion and monomer elution for different commercial composites

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Não há conflito de interesse

This study aimed to evaluate the color stability (ΔE) of three commercial brands of composite resins when immersed in distilled water, within 24 hours, 30 days and 180 days, as well as the degree of monomer conversion and BisGMA component release. Five specimens of each resin shade were made for color stability evaluation (Easyshade 4.0, Vita) and three specimens for the degree of monomer conversion evaluation (FTIR). Each increment of resin in the specimens was light-cured for 20s using a polywave LED and these were then stored in distilled water at 37°C after photoactivation. A color scale pattern was made from the material studied, following the Vita (Vita) scale, to determine a standard of comparison. The elution of BisGMA was analyzed by liquid chromatography with mass spectrometer. The three-way ANOVA test allowed us to observe that the interaction between time/shade/brand was significant (p = 0.0001), with all the studied resins showing color changes in relation to the pattern in the studied periods. Empress Direct was the only one to display ΔE≥2.7over the 180 days on shades B1 and A1, and there was no significant correlation between degree of conversion, ΔE and BisGMA elution. There was a significant direct correlation between degree of conversion and ΔE in 30 days and inverse in 180 days.

Thus, it is suggested that there is a stabilization of the resinous material after 30 days and thus, a balance of its optical properties.

HA009 — Effect of different surface treatments and glaze application on the wear resistance of a stained hybrid ceramic

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Não há conflito de interesse

To evaluate the effect of surface treatment and glaze application on the external staining wear resistance of a hybrid ceramic. Thirty-two (32) specimens (14 x 10 x 3 mm) were glued to a wheel device and divided in 8 groups according to the surface treatment prior to the staining (polishing: Pol, acid etching: Ac, sandblasting: Sd, or self-etching silane: Ses) and glaze application (with: gl or without: -gl). After the wear test on the ACTA wear machine, the staining wear rate was determined during seven intervals of 20,000 cycles, using a profilometer. The three-body wear rates were analyzed using three-way ANOVA and post-hoc Tukey test, all with α=5%. Scanning Electron Microscopy (SEM) analysis was performed to access the surface wear profile. The three-body wear rates were affected by surface treatment*glaze application*number of cycles interaction (p < 0.001). 100% of the staining was removed at 20,000 for Pol, at 40,000 for Pol+gl, at 60,000 for Ses+gl, at 80,000 for Ac, at 100,000 for Sd and Ses, at 120,000 for Ac+gl and at 140,000 for Sd+gl. SEM showed similar worn surface profiles for the tested groups and the glaze removal occurred after 140,000 cycles.

The sandblasting followed by glaze application as surface treatment showed more suitable capability to maintain the external staining on hybrid ceramic surface. The glaze application did not protect the stain regardless the ceramic surface treatment performed.

HA010 — Changes in zirconia surface architecture and evaluation of shear bond strength with veneering ceramic after plasma treatment

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Não há conflito de interesse

To characterize the zirconia (Y-TZP) surface submitted to different surface treatments (with and without plasma associations) and to evaluate the shear bond strength (SBS) with the veneering ceramic (VC) after different aging periods. 301 Y-TZP specimens were fabricated and divided into 7 groups (n=43): C (control): no treatment; Al: airborne abrasion with 27 μm Al2O3 particle; L: liner; P: plasma; Al+L: airborne abrasion + liner; Al+P: airborne abrasion + plasma; P+L: plasma + liner. The Y-TZP surface was characterized by SEM, EDS, AFM, roughness, and surface-free energy (SFE). XRD was used to verify the crystal structure after each surface treatment performed. SBS between Y-TZP and the VC was verified after three aging protocols: initial and after hydrothermal aging (autoclave for 5h) and thermal fatigue (30,000 baths - 5-55°C). One- (roughness and SFE) and two-way ANOVA (SBS), and Tukey's HSD test were used as a statistical analysis. For the plasma groups, a homogeneous and full surface coverage was observed on SEM and AFM, with globular formation. Peaks of Si were found for Al, L, Al+L, and P+L groups. Roughness was lower for groups C, P, and Al+P. For SFE, the highest values were found when the liner was applied. The higher monoclinic content was found for Al+L and Al+P. For the initial and after thermal fatigue, the P group presented the highest SBS values.

Plasma treatment itself or associated with liner was capable to deposit a film on the zirconia surface without altering its structure and to improve the SBS with VC, even after aging.

HA011 — Objective assessment of the combined effect of exomass-related and motion artefacts in Cone beam CT

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Não há conflito de interesse

The aim of this study was to assess the combined effect of cone-beam computed tomography (CBCT) exomass-related and patient motion artefacts. A cylindrical phantom containing 21 tubes filled with a radiopaque solution, allowing the inclusion of three titanium implants in the periphery to induce exomass-related artefacts, was mounted on a robot simulating 0.75-, 1.50-, and 3-mm movements (nodding/lateral rotation/tremor). CBCT images with/without exomass and with/without movements were acquired, in duplicate, in three units. Voxel value mean and standard deviation were assessed from each tube. For each CBCT volume, the 21 mean voxel values were averaged providing the overall mean voxel value (OMVV), and the standard deviation was calculated providing overall voxel value inhomogeneity (OVVI). The standard deviation from each of the 21 volumes-of-interest were averaged, providing overall image noise (ON). OMVV, OVVI, and ON were averaged for the duplicate acquisitions. The effect of the diverse tested conditions was inferred from a repeated-measures analysis of variance, followed by Sidak's test (α=0.05). Images acquired with exomass had lower OMVV, and higher OVVI and ON. Movement artefacts aggravated exomass-related alterations. OMVV and OVVI were mostly affected by 3-mm nodding movements. Motion-artefact correction was effective.

In conclusion, CBCT images are altered by exomass-related artefacts, and this finding is aggravated in the presence of motion artefacts. Motion-artefact correction eliminated the impact of movement.

HA012 — Automated Identification of Dental Implants by Using Artificial Intelligence

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Não há conflito de interesse

The aim of this study was to develop and evaluate accuracy of a computer assisted system based on Artificial Intelligence (AI) for detecting and identifying automatically Dental Implants(DI) brands using digital periapical radiographs.A total amount of 1800 digital periapical radiographs with DI from three distinct manufacturers (f1,f2,f3) f1=600, f2=600 and f3=600 was split into training dataset (n = 1440 [80%]) and testing dataset (n = 360 [20%]) groups. The images were evaluated by a software developed through Convolutional Neural Networks (CNN) aimed to identify the manufacturer of IDs contained therein. Accuracy, Sensitivity, Specificity, positive and negative predictive values, and ROC curve were calculated for detection and diagnostic performance of CNN algorithm. At the final epoch (25), it was obtained 99.78% of system accuracy for training data, 99.36% for testing data and 85.29% for validation data. The latest one corresponds to the actual accuracy of dental implant manufacturer identification contained in digital periapical radiographs after the system learning process.

The results obtained in this study show that Deep CNN algorithm provides high accuracy for identifying dental implants by means of digital periapical radiographs, being a useful tool in odontological practice. With a more comprehensive data bank, this system may be widely used helping dentists to work with more predictability and to eliminate the challenge of discovering the implant model installed in patients when there is no previous treatment information.