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Editorial

Dental Materials Coatings: Effect on the Clinical Behavior

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Contemporary dentistry allows the application of digital procedures associated with optimal biomaterials to enhance the patient's life quality. As doctors, we have been encouraged to adapt ourselves in every aspect of our job, from the diagnosis to the prosthetic manufacturing [1,2].

The newer biomaterials will have to become much more damage-tolerant and able to provide a longer lifetime survival. For this reason, biomimetic replacements, tissue engineering scaffolds and even cloned teeth would be the best choice for future treatments [3,4].

In the intraoral environment, temperature, pH, electrochemical potential, concentrations of species in the solute, and oxygen concentration have the ability of reacting directly with the different materials used [5]; therefore, protective layers such as glazing and coatings are mandatory to reduce the effects of the oral environment on these materials and provide a long term clinical stability. Therefore, the clinician should know the material characteristics and how to improve its mechanical behaviors against the unfriendly conditions of the oral environment.

Dental ceramics are widely used as reliable restorative materials, and the surface finishing technique is an important step that can influence the cyclic fatigue and the ceramics restorations topography [6]. In the same way, the polished glass ceramics are sensitive to the load profile variation, which explains the effect of surface morphology on the fatigue resistance [6].

A significant protective effect on the chemical solubility of a glass ceramic under different pH environments can be evidenced when protective coating is applied on its surface. Therefore, for different restorative materials it would be interesting to know if the same behavior can be noted or if different coating materials could present another behavior.

Besides the environment, it is known that surfaces defects arise from clinical and laboratory procedures, regardless of the manufacturer material's processing method. In this sense, if the topographical defects created during surface treatments are filled by composite cement during the luting procedure, the strength of the material can be improved [7]. On the other hand, if those defects are not completely filled by composite cement, the fatigue performance of the ceramic restorations may decrease caused by high stress magnitude inside these defects during the load incidence. However, we should not indicate or apply a less aggressive surface treatment only to reduce the material defects population, since it could negatively affect the restoration bond strength and consequently reduce the restoration survival. Therefore, the literature still seeks for a protocol that combines optimal bond strength, with the minimal modification in the material structure and long-term reliability.

Regarding the wear rate of indirect materials, not only the microstructure can influence the wear rate, but also the application of shade characterization layer and glazing as coatings on its surface since, regardless the materials mechanical properties, the extrinsic staining layer durability will be affected by the glass phase quantity on the restorative material. In addition, in hybrid materials

that need polymeric coatings, a surface treatment is mandatory to improve its longevity. However, the wear rate and material performance after glazing and shade layer removal are not investigated in the literature yet.

The superficial topography of the material or coatings with low roughness and adequate homogeneity could also be related to bacterial adhesion and human cell viability. Therefore, the laboratorial and clinical modifications will affect not only the mechanical aspect of the dental materials as the biological response.

Regarding direct restorative procedures, in order to provide improvements to chewing load dissipation, polymerization residual stress and microleakage prevention, coatings with a functional layer could improve the restoration performances even, modifying the wettability of polymers for example. Polymeric biomaterials for dental application can also be applied as coatings for direct and indirect restoration, and they allow the nanoparticles deposition on its structure [8]. This approach can modify the polymeric biomaterials film thickness and mechanical properties and allow new indications and treatments.

Considering temporary materials, such as glass ionomer cements, the introduction of coating agents was intended to prevent moisture contamination, to reduce gingival microleakage and to improve the mechanical properties of the restoration. Nowadays, even the water absorption/solubility and color change can be reduced with the aid of resin-based coatings layer application. Therefore, the short-term performance for temporary materials can be extended if necessary and the dental treatment becomes easier for the dentist and patient.

In terms of dental implants, the surface modifications and surface coatings using a variety of materials and biomolecules have been increased in the last 20 years to achieve a beneficial effects with the bone interaction. Bone healing, osseointegration and corrosion are just few examples of possible modifications that can be noted with the use of adequate coatings.

Alternative processing methods, as addictive manufacturing and use of technologies such as microwave heating can modify the mechanical response of the contemporary dental materials and even allow the development of smart materials and coating layers that will improve our dental treatments reliability and prognosis.

The most appropriate biomaterials should, nowadays, be linked with the most appropriate procedure, controlling clinical and laboratory parameters to get the most out of our therapeutic plan, always respecting our patient's systemic condition. The improvement of the mechanical and biological qualities of the new materials should be carried out with specific surface treatment and coating layer application and dental materials research should follow this philosophy when aiming to improve the properties of any material available.

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