Zirconia - cementing or luting

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Abstract:

Despite the biocompatibility and perfect aesthetics of dental ceramics, failures are still of considerable concern because of some problems that are clinically experienced. There is limited information about the retentive strength of luting agents for zirconium oxide-based crowns. On the market there are different types of cements that are available for fixating of zirconia restorations. So far there is no consensus regarding the best protocol for zirconia luting used in dentistry. Zirconia core-based ceramics are highly resistant to chemical attack from hydrofluoric acid and a different approach is required if clinician elects to bond these restorations using resin-based adhesives and luting cements. Optimal surface preparation is mandatory to ensure clinical success when cementing/luting a zirconia restoration. Although zirconia for dental restoration is used already for decades, the best method to ensure a stable bond between the zirconia and tooth structure is still questionable.

Introduction

Zirconia, which is having similar color as a real tooth and mechanical properties that are close to the properties of metal, is often used. Zirconia has been widely used in dentistry because of their superior mechanical properties compared to other available all-ceramic systems. Zirconia restorations are used for crowns, bridges and implant abutments. However, there are some clinical obstacles that include de-cementation of the restorations from zirconia, chipping of the aesthetic incrustation.

Purpose

The aim of this review is to explore and describe the options for preparing the surface of zirconia for more stable definitive cementation.

Materials and methods

In literature there are few methods that are known for providing a good bond between the tooth structure and the zirconia restoration:

1. Technique of silica coating followed by silane application. The technique uses silica-coated 30 mm aluminum oxide particles (3M ESPE), followed by the application of silane. According to the manufacturer, sandblasting with this mate-

rial uses impact energy to apply a silica coating to the inner surface of the restoration.

The technique is effective also when bonding to composite and metal posts. Silica coating of metal or composite substrates not only mechanically roughens the substrates, but also increases the number of available hydroxyl groups for surface silane coupling.

2. Tribochemical coating is less effective for zirconia ceramics than for glass-infiltrated ceramics. This technique uses air pressure which impregnates the ceramic with silica particles and further silane application renders the impregnated surface chemically reactive to the resin cement.
3. Selective infiltration etching (SIE) is a surface treatment developed to transform the dense and nonbonding surface of zirconia into a highly retentive surface through the establishment of inter-grain nano-porosity where the adhesive resin-composite can infiltrate and interlock. SIE utilizes a specific glass infiltration agent that is able to diffuse in the grain boundaries and results in nanointer-grain porosity. After rinsing off this agent, the surface of zirconia is readily capable of establishing a nano-mechanical bond with the adhesive resin-composite of choice.

Silanes cannot react directly with the chemically inert zirconia. Some other reactive functional

silanes beside methacrylatesilane have recently been evaluated in bonding resins and luting cements to silicacoated zirconia. Considering the metallic nature of pure zirconium, recently an experimental hot chemical etching solution has been advocated for treating zirconia.

Some studies have demonstrated good results with tribochemical treatment. There is some evidence that a good bond to Y-TZP ceramics is obtained using resin cements with phosphate ester monomers, (MDP monomer). The phosphate ester group chemically bonds to metal oxides such as zirconium dioxide.. The MDP based cement presented with higher bond strength to zirconia surfaces Yoshida and others stated that the bond strength between zirconia and the resin cement increased significantly when the intaglio surfaces were coated with an MDP based metal primer.

Conclusion

We have to pay attention that no single specific surface treatment protocol is validated to optimize zirconia bonding. The only consensus found in the literature research is that hydrofluoric acid etching and use of silane agents are not effective for zirconia ceramics.

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