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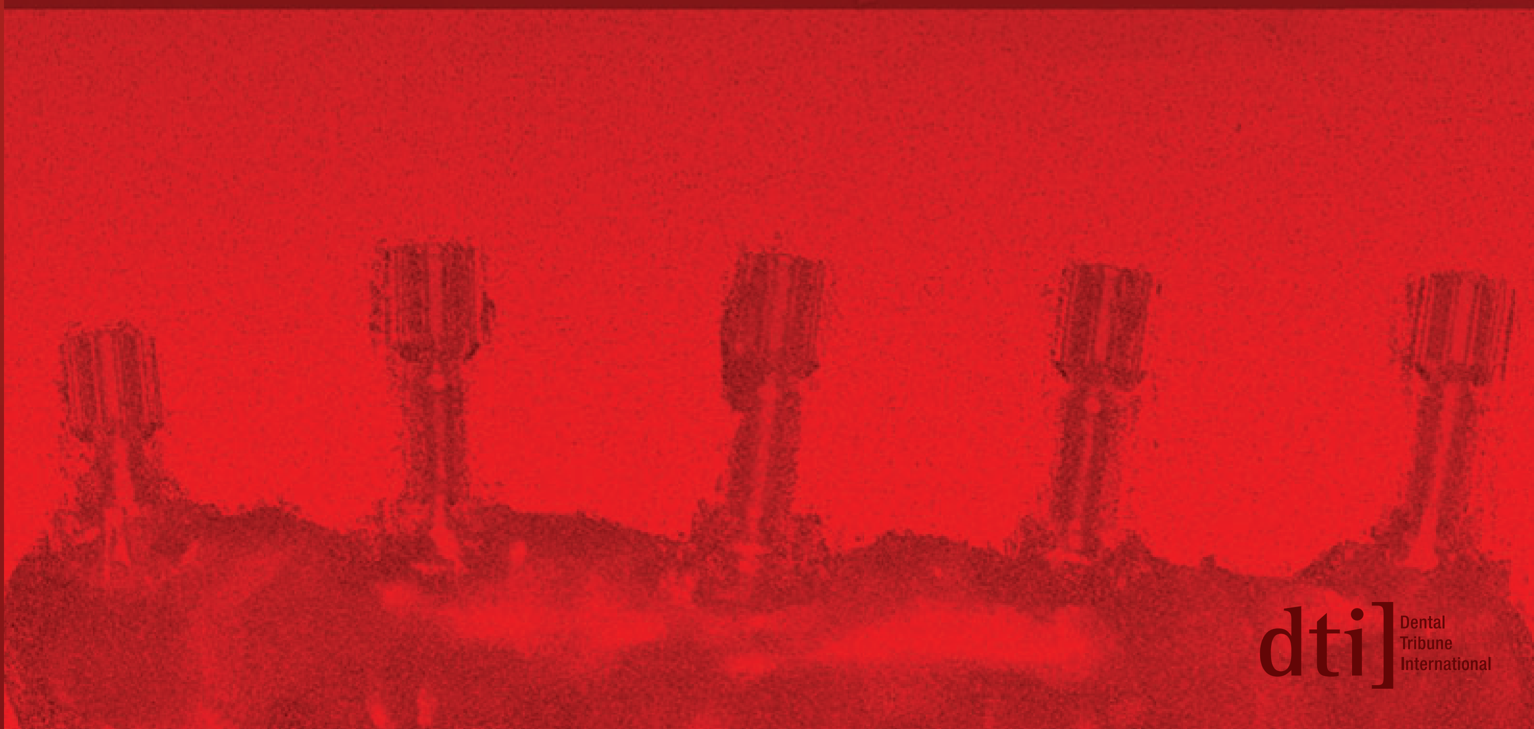

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Editorial

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Is early implant failure a consequence of apical periimplantitis?

Biological failure of dental implants is divided into early (failure to establish osseointegration) and late (failure to maintain established osseointegration). Most of the time, early implant failure is diagnosed as a failure of osseointegration, which is the same as saying idiopathic implant failure. A deeper analysis of early failures should consider early apical periimplantitis, also known as an implant periapical lesion, which is an infectious-inflammatory process of the tissue surrounding the implant apex.

During the early stages of this process, the coronal bone architecture may be preserved, though progression will lead to an osseointegration failure. Early apical periimplantitis constitutes early failure, since the osseointegration process is interrupted (at least around part of the implant) and is diagnosed between 7 days and 3 months after implant placement.

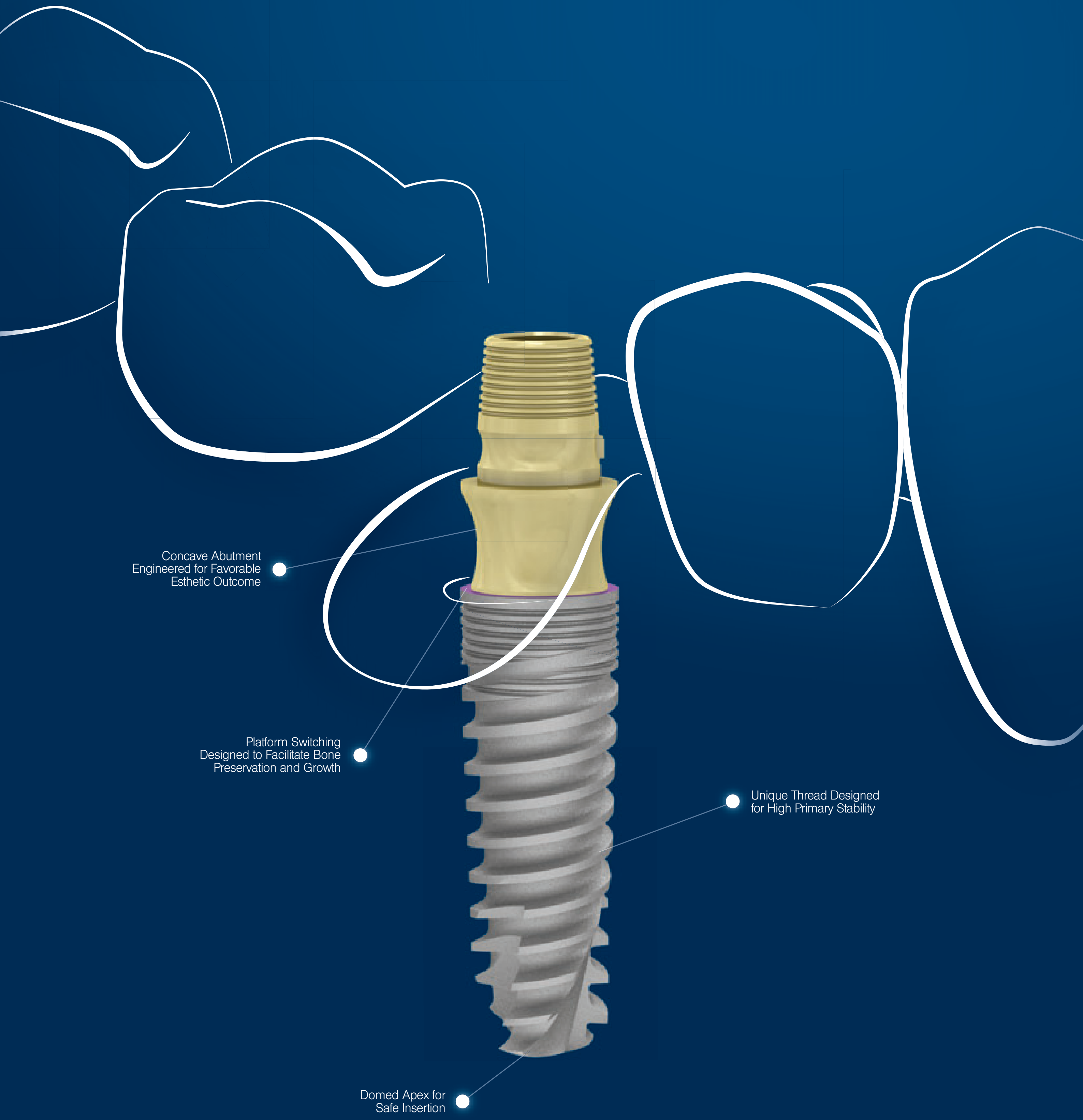
Various etiological factors have been suggested, based on the potential source of contamination: implant surface contamination, overheating during drilling, pre-existing disease, immediate post-extraction placement, endodontic disease associated with the extracted tooth or adjacent teeth, pre-existing bone disease, and the presence of root remains or foreign bodies. The body of evidence is very limited, however. At present, early periimplantitis is considered to have a multifactorial origin, involving exposure to 1 or more triggering factors.

Apical periimplantitis is rarely diagnosed, so it is difficult to have a significant number of cases with previously recorded information of the state of the adjacent teeth and of the tooth being replaced, as well as information on the surgical procedure, to identify risk factors for early apical periimplantitis. There are failed osseointegration processes that have similar signs and symptoms to those of periapical implant lesions, which are a consequence of incorrect 3-D implant placement (such as flapless implant placement and fenestration of the buccal plate) or infections of biomaterials.

It is difficult to know the true dimension of this clinical condition and its total impact regarding early implant failures because there are few studies in the literature addressing it. Further knowledge of this condition will lead to its prevention and early treatment, and will reduce the number of early implant failures.

Dr. Miguel Peñarrocha Diago
Editor-in-Chief

Content



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Efficacy of a universal adhesive on the bond strength of a luting cement to leucite-reinforced glass-ceramic

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Abstract

Objective

The present study compared the efficacy of a universal adhesive containing silane, bis-GMA and 10-methacryloyloxydecyl dihydrogen phosphate (10-MDP) monomer with that of silane applied alone or combined with bis-GMA or 10-MDP, but in separate steps, on the microtensile bond strength of a CAD/CAM leucite-reinforced glass-ceramic to a resin cement.

Materials and methods

Sixty-four blocks from IPS Empress CAD (Ivoclar Vivadent) were etched (5% hydrofluoric acid) and treated with:
(1) RelyX Ceramic Primer (3M ESPE; control group; group 1);
(2) RelyX Ceramic Primer + Adper Scotchbond Multi-Purpose Adhesive (group 2);
(3) Single Bond Universal Adhesive (3M ESPE; group 3);
(4) CLEARFIL PORCELAIN BOND ACTIVATOR + CLEARFIL SE BOND PRIMER (both Kuraray Noritake Dental; group 4).
The blocks were bonded in pairs with RelyX ARC (3M ESPE) and sectioned into microbars, which were submitted to microtensile testing. Microtensile bond strength data (MPa) were analyzed by 1-way ANOVA and Tukey tests ($\alpha = 0.05$). Failure mode was determined under a stereomicroscope (×20).

Results

The control group, group 2 and group 4 exhibited microtensile bond strength values not statistically different from each other, but higher than those of group 3. Group 2 presented the lowest percentage of adhesive failures and the highest percentage of cohesive failures within the resin cement.

Conclusion

The universal adhesive showed the worse performance on the microtensile bond strength of a CAD/CAM leucite-reinforced glass-ceramic with a resin cement when compared with that of silane applied alone or combined with bis-GMA or 10-MDP, but in separate steps. Long-term studies investigating how these groups behave when submitted to hydrothermal aging, simulating the oral environment over time, are necessary.

Keywords

Dental bonding; adhesive; dental porcelain.

Introduction

Nowadays, the increasing demand for esthetic restorations has stimulated the development of esthetic restorative materials and, concomitantly, new adhesive systems. Although zirconia and lithium disilicate ceramics have been widely used for manufacturing metal-free restorations, in the case of veneers, inlays/onlays and even anterior crowns, leucite-reinforced glass-ceramics could be an interesting option considering their esthetic potential and higher mechanical strength compared with conventional feldspathic porcelains.[1]

In order to achieve successful cementation, both micromechanical interlocking and chemical bonding should be present.[1] For silica-based ceramics, the first bonding mechanism is successfully achieved with hydrofluoric acid (HF), which dissolves the glassy matrix surrounding the crystalline phase, creating a microretentive surface and consequently, an increased bonding area.[2–4] The chemical bond between the silica of glass-ceramics (Si–O–Si formation by means of condensation reaction) and the organic groups of resin cements is achieved via silane coupling agents, more commonly methacryloxypropyltrimethoxysilane (MPS).[1, 5–7] Therefore, for bonding glass-ceramics, etching with HF followed by silane is the classical protocol.[8]

More recently, universal adhesives were developed with the aim of simplifying the time-consuming procedure of conditioning both the tooth and the restoration surface with etch-and-rinse adhesives, providing a single product that meets the needs of different substrates. Some of these universal adhesives (Single Bond Universal Adhesive, Scotchbond Universal, CLEARFIL Universal Bond) contain as main components silane, 10-methacryloyloxydecyl dihydrogen phosphate (10-MDP) monomer and dimethacrylate (bis-GMA), all together in a single bottle. According to the manufacturer (3M ESPE) of the Single Bond Universal Adhesive, each component was added with a specific purpose, that is, 10-MDP to provide chemical bonding to zirconia, alumina and metals; and silane to chemically bond to glass-ceramic surfaces. The application of a thin layer of resin to the previously HF-etched and silane-treated ceramic surface improves adhesive bonding by providing better wetting of the ceramic surface by the resin cement.[2, 3] The bis-GMA monomer commonly present in universal adhesives can achieve this purpose, in addition to acting as a cross-linker,[9] without the need for an additional step.

However, the combination of all these components in a single bottle might cause some interference in their roles, either by a chemical interaction between them[10, 11] or even by some competition to react with the substrate.[12] In a study in which zirconia was air-abraded with silica-modified Al_2O_3 particles, the authors raised the possibility of having influenced competition between the silane and 10-MDP of Scotchbond Universal adhesive to interact with the ceramic surface, thus preventing each other from acting effectively.[12] The chemical affinity between 10-MDP and zirconia is well established in the literature.[13, 14] However, since the efficacy of 10-MDP on adhesive bonding to glass-ceramic has been insufficiently investigated, it is not known if the silane and 10-MDP would have their roles compromised when applied to the glass-ceramic in a single step.

The aim of the present study was to compare the efficacy of a universal adhesive containing silane, bis-GMA and 10-MDP with that of silane applied alone (control group) or combined with bis-GMA or 10-MDP, but in separate steps, on the microtensile bond strength (MTBS) of a CAD/CAM leucite-reinforced glass-ceramic with a resin cement. The null hypothesis was that the performance of the universal adhesive would be similar to that of the silane applied alone (control group) or combined with bis-GMA or 10-MDP, but in separate steps.

Material and methods

The materials used in the present study are summarized in **Table 1**.

Specimen preparation

Sixty-four ceramic blocks (IPS Empress CAD, Ivoclar Vivadent) were obtained (12 × 10 × 5 mm) using a saw (IsoMet 1000, Buehler) with a water-cooled diamond disk and were polished under wet conditions with 180, 400 and 600 grit silicon carbide abrasive papers.

One surface of each block was etched with 5% HF for 1 min, washed under tap water and dried at room temperature for 24 h. The surfaces received

(1) RelyX Ceramic Primer (3M ESPE; RX; control group);
(2) RelyX Ceramic Primer + Adper Scotchbond Multi-Purpose Adhesive (3M ESPE; RXASM);
(3) Single Bond Universal Adhesive (SBU);