ONE CEMENT TO BOND THEM ALL...
Universal cement Maxcem Elite

Maciej Mikołajczyk DDS PhD

The journey of adhesive prosthetics commenced with the advent of using ceramic veneers bonded to the front of teeth. Initially, the design of both the veneer and the tooth's surface offered no possibility for mechanical grip or frictional resistance to enhance the bonding strength between the prosthetic and the tooth. The sole force keeping the veneer attached to the tooth was chemical adhesion. This was feasible because the veneers were affixed to the enamel, which, after being etched and treated with specific bonding agents, achieved the highest possible chemical bonding strength with the cement, and thus with the ceramic veneer's sur-face, within the mouth. This process not only secured the veneer in place but also reinforced its structure, which was extremely fragile and had low mechanical strength when made solely of layer-fired ceramics before being attached to the tooth.

The shift towards metal-free dental works, prized for their biological and aesthetic benefits, spurred the creation of stronger ceramic materials, including pressed and milled ceramics, and the use of advanced composite materials. Dentists expanded their use to a broader range of prosthetic repairs, such as crowns, bridges, inlays, and onlays, beyond just veneers. However, these applications demanded robust adhesion to dentin, often in cases with minimal enamel contact, like with crowns and bridges. Adhesion to dentin proved significantly weaker than to enamel, especially after etching. The bonding process, following the total etch technique, involved multiple steps of primer and adhesive application, making it complex and prone to errors. Moreover, light polymerization of the cement was less effective for prosthetics other than veneers. Consequently, the adhesive bonding of met-al-free restorations to dentin was fraught with a high risk of failure. The complexities previously encountered in dental adhesion have been addressed with the advent of self-adhesive dual-curing cements, a prime example being Maxcem Elite from Kerr. This product achieves robust adhesion to dentin effortlessly, bypassing the intricate application steps traditionally required, due to its formulation with Glycerol phosphate dimethacrylate (GPDM).

About Maciej Mikołajczyk

Graduated from the Dental Faculty of Lodz Medical University. Author and co-author of multiple thesis on minimally invasive treatment in prosthetics and traumatology. He received his PhD degree in 2008 for a thesis on "Evaluation of ozone influence on dentine infected with caries bacteria". He holds classes for foreign students in English at Dental Faculty of Lodz Medical University. In 2010-2012 he was a scientific director and speaker for an international educational program organised by "Forum Dentysty Praktyka" magazine. Since 2013, editor in chief of "Endodoncja w praktyce gabinetu" ("Endodontics in dental practice") educational publication cycle. Member of scientific board of "Cosmetic Dentistry Beauty and Science" magazine. Speaker in multiple conferences and workshops focusing on minimally invasive techniques in dental prosthetics, ergonomy, restorative dentistry and endodontic treatment in Poland and abroad. Owner of a private dental practice in Łódź. Key Opinion Leader and paid consultant of Kerr.

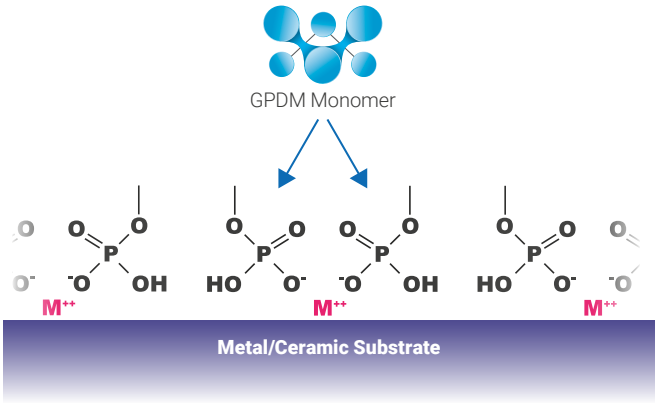

Fig.1 GPDM monomer bonds onto the metal and ceramic surface through metal chelation process.

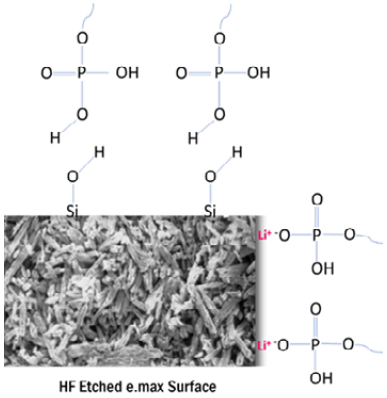

Fig.2 GPDM monomer bonds onto Lithium Disilicatecess.

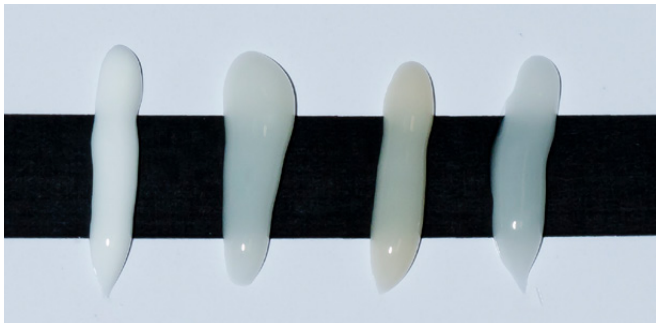

Fig.3 Different colors of Maxcem and ability to mask or change shade beneath. From left side: opaque white, white, yellow and clear. Portions of material are thick about 1 mm and still effect can be seen.

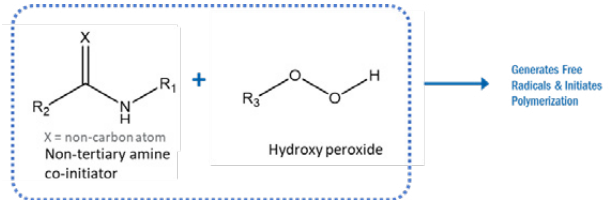

Fig.4 Kerr's unique Nexus™ Technology Tertiary-amine and BPO free self-cure initiator system (Non-Amine redox initiator system.

This GPDM formulation allows for its effective use in affixing a wide range of dental prosthetics, including crowns, bridges, prosthetic posts, onlays, and fiber-glass root posts. [Fig.1] [Fig.2]

With the addition of a suitable type of silane, Maxcem Elite also excels in securing metal-free and metal-based restorations. Thanks to the simplified cementation procedure, the risk of operator error is minimized, and the procedure itself is short, leaving plenty of time for care-ful removal of excess cement after cementation.

In addition, Maxcem Elite offers a broad palette of colors unique to its category—Clear, White, Yellow, and White opaque—each tailored for specific uses. **[Fig.3]**

• For aesthetic metal-free restorations such as crowns, bridges, or veneers, dentists have the ability to subtly adjust the color of the restoration crafted in the prosthetic laboratory by choosing Maxcem Elite White, Yellow, White Opaque, or maintain its laboratory produced color by opting for the Clear shade.

• White Opaque is particularly beneficial for cementing fiberglass root posts, providing a strong contrast that aids in future dental procedures such as subsequent prosthetic preparation or the need to undergo re-endo.

• For prosthetic metal posts and onlays, White or Yellow shades are ideal to seamlessly blend the restoration with natural tooth tissue on the occlusal surface, while Clear and White Opaque can accentuate the distinction between the prosthesis and enamel.

Boasting exceptional color stability due to its non-amine redox system, Maxcem Elite ensures the longevity and perfection of the restoration's shade. [Fig.4] Its simplicity in use, combined with its adaptability, positions Maxcem Elite as the go-to dual adhesive cement for dentists, applicable across all dental restoration tasks.

Fig.5 Metal splinting of incisor teeth after trauma with the use of orthodontic wire and SimpliShade/OptiShade composite.

Fig.6 Open pulpal chambers of both incisors after pulpectomy, before mechanical preparation of canals. Visible fractures of the crowns involving root surfaces from the palatal side of teeth.

Fig.7 Teeth 11 and 21 after canals obturation with gutta percha, moment before further procedures of cementing EASYPOST glass post inside.and SimpliShade/OptiShade composite.

Fig.8 Optidam system dental dam used for isolation of teeth for endodontic procedure and cementing glass posts at the same visit. Note additional flow material colored blue for fixing the clamps.

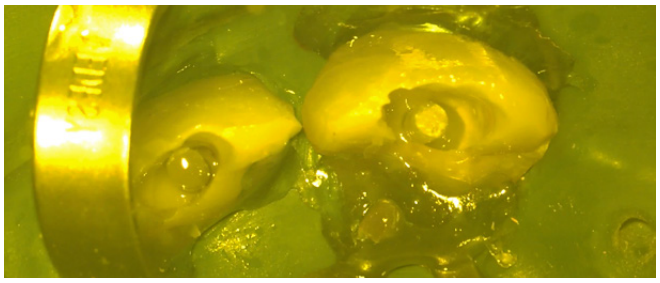

Fig.9 Easy Post glass posts diameter 1,375 mm introduced inside canals filled with cement. It should be located in the central part of canal, with visible spare space for core material.

In the described clinical scenario, a 12-year-old patient presented with injuries to their upper incisors, incurred 6 hours prior, involving partial luxation of teeth 11 and 21. The injuries were compounded by crown fractures and significant pulp exposure, with the fractures extending subgingival on the palatal side. Initial treatment involved splinting the teeth and performing pulpectomies. **[Fig.5]**

Subsequent visits focused on root canal treatment using the Traverse & Zenflex system to prepare the canals to an ISO size 35, taper 06, and filling them with warm gutta-percha through the Elements IC system. **[Fig.6] [Fig.7] [Fig.8]**

To reinforce the incisors, Easypost glass fiber posts were anchored into the canals using Maxcem Elite (white opaque) cement, followed by polymerization. **[Fig.9] [Fig.10]**

The tooth crowns were further strengthened using the Build-it FR material and OptiBond eXTRa Universal adhesive system, in preparation for prosthetic crowns. **[Fig.11]**

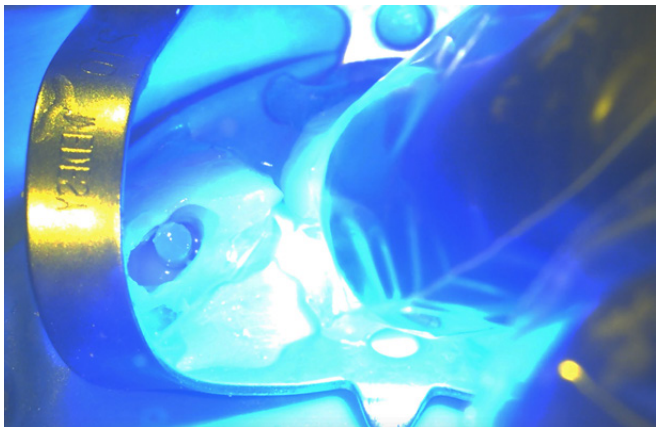

Fig.10 Polymerization of cement with a lamp after 2 minutes of waiting for chemical part of polymerization to commence. MAXCEM is dual cure so it will harden deep inside canal even if the polymerization light will not reach it there.

Fig.11 Prepared pillars of teeth 11 and 21 for composite crowns. Note that part of each pillar is made of Build-it FR core material, but most is just dentine tissue.

Considering the patient's age and potential for future tooth color changes, laboratory composite crowns were chosen for their ease of replacement. Cementation was performed using Maxcem Elite Clear. The crowns were tried on and their inner surface were treated by sand-blasting with aluminum oxide powder with diameter of 35 µm and applying Silane Primer for optimal adhesion. **[Fig.12] [Fig.13] [Fig.14] [Fig.15] [Fig.16]**.

The prosthetic abutments were cleaned and smoothed before applying the cement inside the crowns using Occlubrush. A small portion of the cement was squeezed out to allow it to mix properly. Later, cement was applied inside the prosthetic crown. The crown was placed on the abutment and the excess was removed. It is best to wait for cement to react to the gel phase and then clean all the excess with a simple move of a dental probe, without any risk of damaging the crown surface. The procedure was repeated for the second crown. After 2 minutes, polymerization was carried out using a polymerization lamp. **[Fig.17] [Fig.18] [Fig.19] [Fig.20]**.

Fig.12 Both crowns ready on plaster model, made in dental laboratory of composite material.

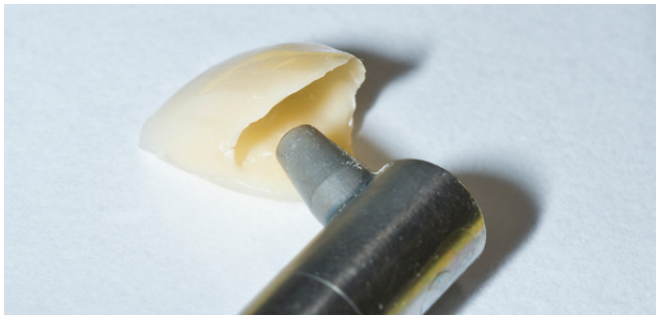

Fig.15 To increase adhesion of a cement to inner surface of a crown it is advisable to air-abrade inside crown with aluminium dioxide powder using standard air abrasion device used in restorative dentistry.

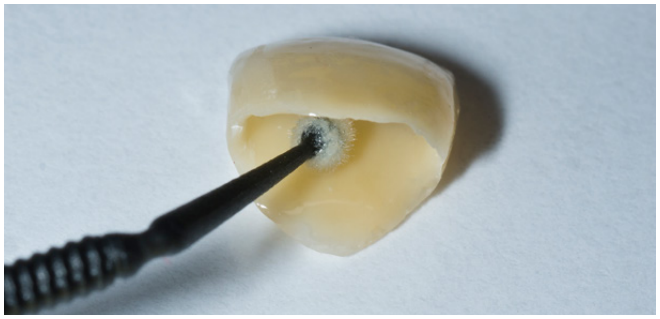

Fig.16 Silane should be applied with a good quality microbrush, and brushed into inner surface of a crown for 20 seconds. Then silane should be left on the surface for 60 seconds to evaporate.

Fig.17 Maxcem should be applied inside prosthetic crowns or bridges to fill it completely without any voids. In this case CLEAR shade was chosen, as color of prosthetic work matched teeth color, so there was no need to change it with additional shade of cement.

Fig.18 Easy excess removal was carried out in a gel phase of cement curing, in case of Maxcem it is very intuitive, and always leaves clean and plain margins of the crown/tooth tissue contact.

Fig.19 Proper cementation from palatal side, where fracture of the crowns deepest, was only possible with a dental dam, that was able to push away gingival margin, and make humidity isolation possible.

Fig.20 Thanks to the wide variety of shades of Maxcem Elite, it is always possible to match the color of cemented prosthetic work with the patient's teeth.

Conclusion

The use of Maxcem Elite cement typically yields aesthetically outstanding results in cementation processes. This is attributed to the ability to choose a suitable cement color and adjust the prosthetic work's color, coupled with the straightforwardness of the cementation procedure.

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Disclosure: Dr. Maciej Mikołajczyk is a consultant for Kerr. The opinions and technique expressed in this article are based on the experience of Dr. Maciej Mikołajczyk. Kerr is a medical device manufacturer and does not dispense medical advice. Clinicians should use their own professional judgment in treating their patients