Egyptian Prosthodontic Association (EPA Newsletter)

Preheated composite resin and flowable composite as alternatives to resin cement in bonding minimally invasive restorations

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Introduction

Minimally invasive indirect restorations, such as laminate and occlusal veneers, have become increasingly popular in modern dentistry [1]. These restorations offer high patient satisfaction while preserving natural tooth structure [2]. One of the critical factors affecting these restorations longevity is achieving a durable bond with the prepared tooth surface [1].

Resin Cements

Resin cements have been traditionally used for cementing conservative restorations owing to their high mechanical properties, low solubility, and ability to bond micromechanically to both enamel and dentin [3]. Light-cured resin cements, are valued due to their color stability and controllable working time [4–6]. However, their high flow, which is attributed to low filler content, also increases their polymerization shrinkage and thermal expansion coefficient, potentially compromising the bonded interface [6, 7]. On the other hand, dual-cured resin cements offer greater mechanical strength, but their limited working time and color instability adversely affect the esthetic outcomes [4, 5]. (Figure 1)

Preheated composite resins

Composite resins, which possess higher inorganic filler content [3, 4, 6] and lower initiator concentration [6] than resin cements, provide improved color stability and wear resistance [3, 6]. However, their higher viscosity, which is attributed to their high filler content, may hinder proper restoration seating [3].

Preheating, which involves increasing the resin temperature between 54°C and 68°C, are recently used to reduce viscosity [3]. This technique improves flow [3], enhances adaptation [4], and enables a thinner cement line [3]. Composite warmers, wax heater pots, and incubators are commonly used for this purpose [3]. (Figure 2)

Cementation employs the typical procedures of restoration fitting surface treatment suitable for the material, together with etchant and bonding agent application to the prepared tooth surface. Preheated composite is then applied to the fitting surface of the restoration followed by gentle seating, excess material removal, light-curing, finishing and

Figure 1: Application of dual-cured resin cement. *Courtesy of* ***D'Addazio G et al.***[8]

Figure 2: Composite resin warmers. *Courtesy of* ***Schmedding T.*** [9], *and* ***Nada K. et al.*** [10]

polishing. (Figure 3)

Preheating has shown to enhance the degree of polymer conversion and the mechanical properties of composite resins [3, 4]. However, this method is technique-sensitive [6] and is affected by the material composition [3, 4, 7], filler characteristics [3, 4], and photoinitiator systems [4]. Additionally, temperature drops rapidly after removal from the heating device, which can impact their handling [3]. Furthermore, the added procedural step and the potential need for higher seating pressure can pose a risk of fracture in thin restorations [4].

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Flowable composite

Flowable composites have gained attention as an alternative to resin cements [5, 11]. These materials show high filler content [5, 11, 12], low viscosity [5, 13], and excellent handling properties [5, 13], all at a relatively lower cost. Their improved adaptability allows minimal pressure during restoration seating, reduced film thickness [7], and easy cleanup without tack curing [14]. Their flexibility makes them suitable for high-stress areas [12], and their low tertiary amine content enhances their color stability [5, 15]. (Figure 4)

Studies showed that highly filled flowable composites can offer bond strengths comparable to, or greater than, resin cements when used with materials like feldspathic or hybrid ceramics [1, 14, 16]. Flowable composites may also reduce the likelihood of voids [14], which are common with two-component resin cements [6].

While promising, further research is needed to validate the long-term clinical performance of preheated composite resins and flowable composites in comparison to resin cements.

Figure 3: Application of preheated composite to the fitting surface of the restoation (a), Restoation seating, with the excess composite flowing freely at the margins (b), The finished and polished final restoration (c). *Courtesy of* ***Schmedding T.*** [9]

Figure 4: Application of flowable composite. *Courtesy of* ***D'Addazio G et al.*** [8]

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