

# Adhesive Prosthodontics

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With the large number of new techniques, technologies, and materials entering the market, many of the traditional paradigms in restorative dentistry are being reconsidered, opening the doors to treatment options that were unthinkable just a few years ago. The driving forces behind these concepts are: predictable, precise, non-invasive, long lasting, easy-to-fabricate, and highly esthetic dental restorations. Two key technologies have brought us that much closer to reaching these goals: adhesive dentistry and CAD/CAM technology.

CAD/CAM technology is currently used in all areas of clinical dentistry and applies to almost all restorative dental material groups, including high-strength and silica-based ceramics, composites, acrylics, metal alloys (e.g., titanium and cobalt chromium), and even wax. Paired with modern intra- and extraoral scanners, the clinical possibilities seem limitless, exemplified by the rapidly increasing popularity of CAD/CAM full-contour zirconia and lithium-disilicate crowns.

The quest for less invasive, longer lasting, and more esthetic restorations has elevated adhesive dentistry to new levels. Improved bonding agents, composites, and resin cements are being



Postoperative view of a 17-year-old patient with maxillary lateral incisor agenesis who received two single-retainer CRBFPDs after orthodontic treatment (clinics by Dr. Margrit Maggio, laboratory work by Michael Bergler, MDT).

developed at an incredible pace. Current developments focus on universal self-etch and self-adhesive products that simplify clinical steps while offering the proven advantages of dental adhesion and resin-composite technology.<sup>1</sup>

A perfect example of pairing CAD/CAM with adhesive dentistry is the all-ceramic resin bonded bridge or fixed partial denture (CRBFPD). CRBFPDs can be applied in select cases of anterior missing teeth as temporary or permanent solutions when other treatment options (e.g., dental implants) are not possible. Zirconia framework materials eliminate the grayish discoloration of the abutment teeth typical for metal-based RBFDPs, yet provide sufficient strength for thin connectors and retainer wings. In fact, long-term clinical evidence for CRBFPDs strongly supports a modified single-retainer cantilever framework design over the traditional double-wing design.<sup>2</sup> Proper application of the most reliable bonding protocol is key for clinical success.

Much of our research over the past decade has focused on the development of such novel protocols and on the creation of less invasive and more esthetic resin-bonded CAD/CAM restorations. Collaborations with the Penn Regional Nanotechnology Facility and Penn's School of Engineering and Applied Sciences have greatly enhanced understanding of the matter and led to clinical recommendations that have significantly contributed to the recent steep increase in the popularity of these innovative treatment options.

The clinical treatment of a single-retainer cantilever CRBFPD starts with a non-invasive preparation design predominantly confined to enamel. The long-term retention of the restoration then relies on the selection



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of the self- or dual-cure composite-resin cement and proper treatment of the tooth and restoration surfaces. Zirconia bonding surfaces are preferably air-particle abraded with aluminum-oxide particles and coated with a special, modified ceramic primer that contains adhesive phosphate monomers that have the ability to chemically bond to metal-oxide ceramics.<sup>3</sup>

"Adhesive Prosthodontics" summarizes the invigorating possibilities when pairing traditional prosthodontic concepts with conservative dentistry paradigms and technological advances. It is an exciting task to be at the forefront of these innovative developments, and to teach our students and provide our patients with the most updated, yet scientifically proven, clinical care.

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