Leveraging modern technology and materials to provide better outcomes for our patients

_In spite of significant advances in the ability to provide predictable, adhesively retained partial-coverage restorations, full-coverage restorations continue to be the mainstay of dental treatment. The vast majority of indirect restorations provided for patients, both anterior and posterior, are full-coverage crowns. This is perhaps not surprising, given that preparing teeth for partial-coverage restorations is more technically demanding and potentially more challenging to facilitate an esthetic outcome, not to mention the added challenges to a traditional workflow when a restoration is to be adhesively cemented.

While bonded partial-coverage restorations present different challenges when compared to conventionally cemented full-coverage restorations, many of these obstacles have been significantly reduced in recent years. The development of novel isolation devices and significant advances in hemostatic agents and dental lasers have made obtaining appropriate isolation for bonding much easier. Vast improvements in resin cement properties and adhesives have made restoration delivery and subsequent clean up easier and less technique sensitive than ever before.

Even more importantly, there now exist highly esthetic ceramics, such as IPS Empress and IPS e.max (Ivoclar Vivadent, Schaan, Liechtenstein) that can mimic natural dentition, be quickly and predictably fabricated, and have a proven track record of clinical success.1, 2

There are a number of advantages to bonded partial-coverage restorations over full-coverage restorations. These largely center around the fact that partial-coverage restorations preserve significantly more tooth structure than full-coverage restorations. Multiple studies have shown partial-coverage all-ceramic restorations to be significantly more conservative of tooth structure, even when compared to a cast gold restoration.3-6

Full-coverage restorations have long been associated with an increased risk for pulpal complications4, which could be significantly avoided with partial-

Author_Clint D. Stevens, DDS
coverage restorations. Specific to anterior teeth, in vitro and in vivo data indicates that long-term prognosis of a tooth restored with a partial-coverage direct or indirect restoration when possible is equal to or better than using a full-coverage restoration.6, 7

Digital impressioning and chairside CAD/CAM technologies further enhance patient outcomes for partial-coverage restorations and eliminate many of the barriers that exist in conventional workflows for partial-coverage dentistry. Perhaps the biggest concern dentists have with partial-coverage dentistry is provisionalization, because of the non-retentive nature of adhesive preparations.

Chairside CAD/CAM, in allowing for single-visit dentistry, eliminates this problem. It also eliminates concerns of persistent pulpal irritation during the days or weeks of provisionalization, thereby further reducing the patient’s risk of subsequent pulpal complications.

Digital impressioning and digital restoration design also give a practitioner much more control over ensuring a quality preparation and one that appropriately supports the proposed restoration, resulting in a more ideal restorative outcome for the patient.

**Case report**

A 70-year-old male presented with a chief complaint of broken teeth as a result of a fall. Clinical examination revealed a small chip in the incisal enamel of tooth #8, as well as significant fractures of the incisal thirds of teeth #9 and #10, extending well into dentin but with no visible pulpal exposure (Fig. 1). Periapical radiographs provided by the patient revealed no overt periapical pathology or root fractures. Periodontal examination found all probing depths to be 3 mm or less, with no bleeding on probing and no tooth mobility. The patient reported a positive, non-lingering response to cold for all anterior maxillary teeth. Based on clinical and radiographic findings, teeth #8–10 were diagnosed with incisal fractures limited to the incisal third of the tooth with a normal pulpal, periapical and periodontal status.

Findings and treatment options were discussed with the patient, including partial-veneer or full-veneer restorations with either composite resin or ceramic. Because of the small size of the incisal chip of tooth #8 limited to enamel, a composite resin restoration was chosen to repair that area.

For teeth #9 and #10, the patient expressed a desire to have the most durable restorative material possible but wished to limit the removal of further tooth structure as much as possible. For this reason, partial-coverage ceramic veneers were chosen to restore teeth #9 and #10.

Minimal modifications to teeth #9 and #10 were made, primarily to remove sharp points and line angles and to place a chamfer margin on the facial surface to help blend the transition of the proposed restorations with the natural tooth structure. Digital impressions were made using the PlanScan Scanner (Planmeca USA, Roselle, IL) (Figs. 2a, 2b).
Following impressions, the partial-coverage veneer restorations were designed using Planmeca’s PlanCAD software (Figs. 3a–4b). The restorations were milled with the Planmeca PlanMill 40 (Fig. 5a, 5b). IPS Empress CAD Multi blocks by Ivoclar Vivadent were chosen for the restorations, as they best matched the patient’s natural dentition (Figs. 6, 7).

Following sprue removal, the restorations were polished with Dialite HP Extra-Oral Polishers (Brasseler USA, Savannah, Ga.) (Figs. 8, 9).

After verifying the fit of the restorations, the partial-coverage ceramics were tried in with Variolink Esthetic Try-In Paste (neutral shade) by Ivoclar Vivadent. This allowed the patient to view the restorations and approve of the esthetics and contours prior to cementation. The restorations were then conditioned for 60 seconds with Monobond Etch & Prime (Ivoclar Vivadent).

An OptraGate (Ivoclar Vivadent) was used during bonding procedures to help ensure adequate isolation. After the teeth were rinsed and dried with water, teflon tape was placed on the mesial surfaces of teeth #8 and #11 to prevent bonding to those teeth during the placement of the restorations. 37 percent phosphoric acid (Total Etch, Ivoclar Vivadent) was selectively placed on the enamel margins of teeth #9 and #10 for 20 seconds, followed by rinsing with water and gently air drying.
Next, the preparations were vigorously scrubbed with Adhese Universal (Ivoclar Vivadent) for 20 seconds, then air dried until no more movement of the layer of adhesive was visible and light cured for 10 seconds with a Bluephase G2 curing light (Ivoclar Vivadent). The intaglio surface of the partial-coverage veneers were covered with Variolink Esthetic LC Neutral (Ivoclar Vivadent) and carefully placed onto the preparations.

After fully seating the restorations, initial cleanup was performed prior to curing with a rubber-tipped gum stimulator. All restorative margins were then covered with Liquid Strip (Ivoclar Vivadent) to prevent an oxygen-inhibited layer and to ensure full curing of the resin cement. Final curing was done for 20 seconds on each surface of each restoration.

After removing excess cured cement with a #12 scalpel and interproximal finishing strips, occlusion was adjusted with a fine grit diamond. Final polishing of the tooth/restorative interface was done with fine grit diamonds and Dialite HP Intra-Oral polishers (Brasseler USA) (Fig. 10).
The small chip in the incisal edge of #8 was then etched with 37 percent phosphoric acid for 30 seconds, rinsed and gently dried, scrubbed with Adhese Universal for 20 seconds, dried and light cured for 10 seconds, followed by the placement of Tetric EvoCeram composite (Ivoclar Vivadent), which was light cured for 20 seconds.

Occlusion was verified and the restoration was polished with Astropol polishers (Ivoclar Vivadent). The patient was seen for a two-week post-operative visit. He reported no issues with his treatment and was very pleased with his final result (Fig. 11).

**Conclusion**

This case illustrates the potential for modern adhesive dentistry and digital workflows to improve outcomes for patients. Partial-coverage ceramics maximized the preservation of natural tooth structure while still meeting the patient’s esthetic expectations, providing him with the most conservative treatment possible and giving the involved teeth the best long-term prognosis for success.

Digital impressioning and restoration design combined with chairside CAD/CAM allowed for these restorations to be performed immediately in a single visit. This greatly streamlined the workflow process and, at the same time, significantly enhanced patient satisfaction.

**References**