Replacement of Failing Restorations in the Esthetic Zone:

Solutions to Clinical and Laboratory Challenges

Julian Conejo, DDS, MSc[1]
Sean Han, CDT[1]
Jose M. Ayub, DDS, MSc[3]
Markus B. Blatz, DMD, PhD[4]

[1]Clinical Assistant Professor, Department of Preventive and Restorative Sciences, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania.
[2]Chief Executive Officer, Master's Arch, Phoenix, Arizona.
[3]Fellow, Department of Preventive and Restorative Sciences, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania.
[4]Professor and Chairman, Department of Preventive and Restorative Sciences, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania.

Correspondence:
Julian Conejo
jconejo@upenn.edu

Modern dentistry advocates for the use of partial-coverage restoration designs, which preserve more tooth structure than traditional full-coverage restorations.[1] This is advantageous even when facing failure of less invasive indirect restorations, because the remaining tooth structure permits the design and fabrication of new restorations, prolonging longevity of the treated abutment teeth.[2]

A high percentage of restorative clinicians' work is the replacement of failing restorations, a difficult challenge in the esthetic zone. Indirect ceramic restorations with open margins, overcontoured shapes, and violation of the biologic width affect the abutment teeth and the surrounding periodontal structures. It can also compromise the esthetic and functional outcomes of the new restorations if a detailed treatment plan and clinical execution is not followed.[3]

This case report addresses key clinical and laboratory concepts for successful replacement of failing indirect ceramic restorations in the esthetic zone. A step-by-step workflow incorporating digital and analog components is described as a possible guide for clinicians and laboratory technicians faced with similar clinical situations.

Case Presentation

The patient presented with existing full-coverage indirect ceramic restorations on the maxillary central incisors and the maxillary left lateral incisor. After clinical and radiographic examination, endodontic treatment on the maxillary central incisors, overcontoured shapes, and deficient marginal adaptations were confirmed. The patient's chief complaint was the unesthetic appearance of the existing crowns, caused by the diastema between the maxillary central incisors, soft tissue recessions, and deficient shape, texture, and color of the existing restorations.

Treatment Planning

Initial extraoral photos were taken to analyze the incisal edge position of the maxillary central incisors and the lip dynamics (Figs 1 to 3), followed by intraoral photos (Fig 4) as well as shade documentation of the maxillary right lateral incisor with a shade guide (VITA Classical, Vita Zahnfabrik; Figs 5 and 6). Diagnostic digital impressions of the maxillary and mandibular arches, followed by a buccal scan of the patient's occlusion in maximal intercuspal position, were also captured (CEREC Prime-scan, Dentsply Sirona) and exported as STL files[4] (Fig 7).

All diagnostic information collected was uploaded into a cloud-based folder for initial virtual treatment planning between the clinicians and dental technician before a new digital design of the maxillary anterior teeth was made. After completion of the digital wax-up, the new STL file was uploaded to the cloud-based folder for 3D printing. This communication method between team members simplifies the workflow, especially when the dental technician is in a different location.

FIGS 1–3 Initial extraoral views at rest, during smile, and during high smile, respectively.

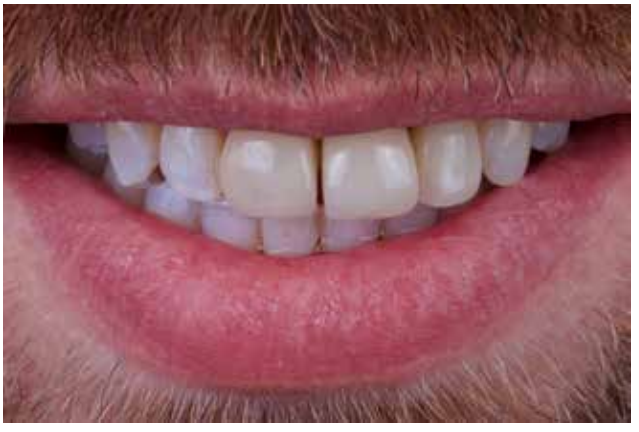


FIG 4
Initial intraoral view of retracted maxillary anterior teeth.

FIGS 5 /6 Shade selection photos are taken at the beginning of the appointment to avoid tooth dehydration and color change.

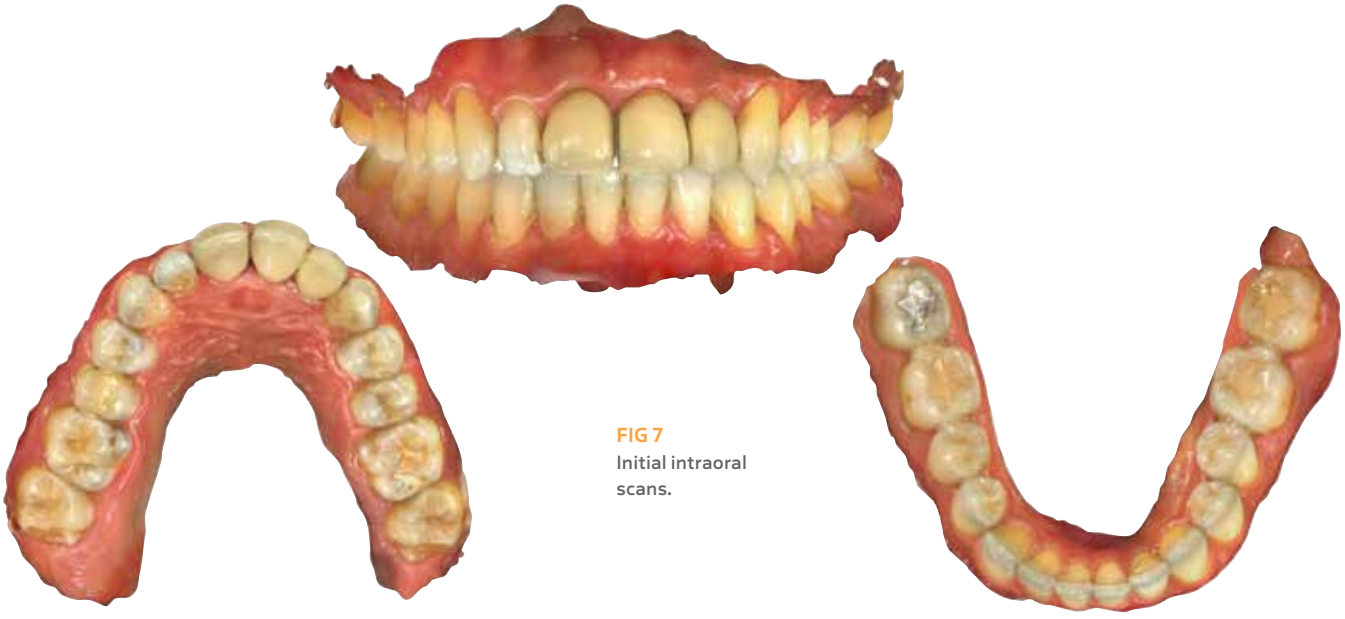


FIG 7
Initial intraoral scans.

Clinical Procedures

The failing ceramic restorations were sectioned with a diamond bur and a high-speed electric handpiece under 4× magnification loupes to avoid any unnecessary removal of the underlying healthy tooth structure. Under rubber dam isolation, the remnants of cement and core build-up material were removed (Figs 8 and 9), and the quantity and quality of the residual healthy tooth structure was analyzed. The abutment teeth were cleaned with a chairside wet air-particle abrasion unit (AquaCare, Velopex; Figs 10 to 12) before starting the adhesive procedures. New core buildups were made with a dual-cure composite resin material (Fig 13). These steps are particularly important when treating abutment teeth with preexisting indirect restorations, because the residual healthy tooth structure is key for the long-term clinical success of the new indirect restorations.

FIGS 8/9 Removal of preexisting cement and core build-up material with a diamond bur and electric handpiece.

FIGS 10–12 Intraoral air-particle abrasion system with aluminum oxide for removing composite and cavity preparation and sodium bicarbonate for cleaning and polishing.

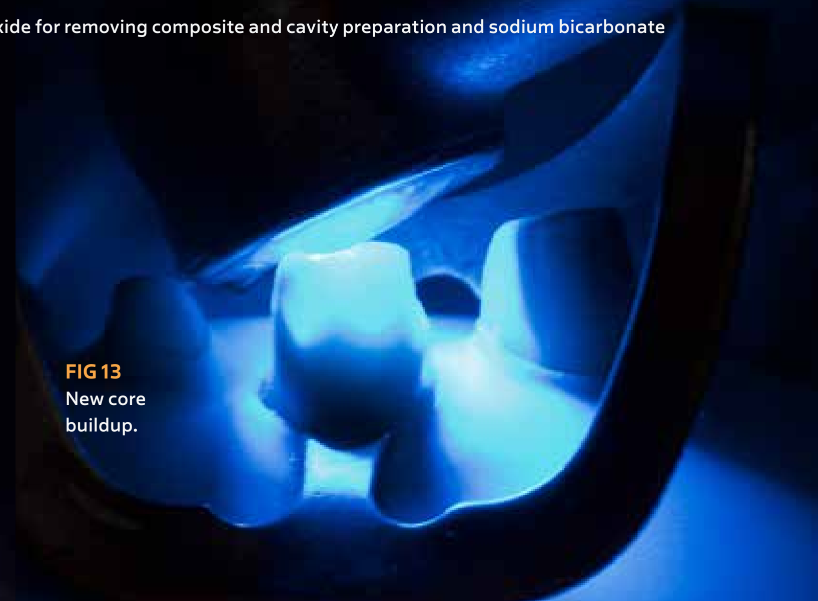
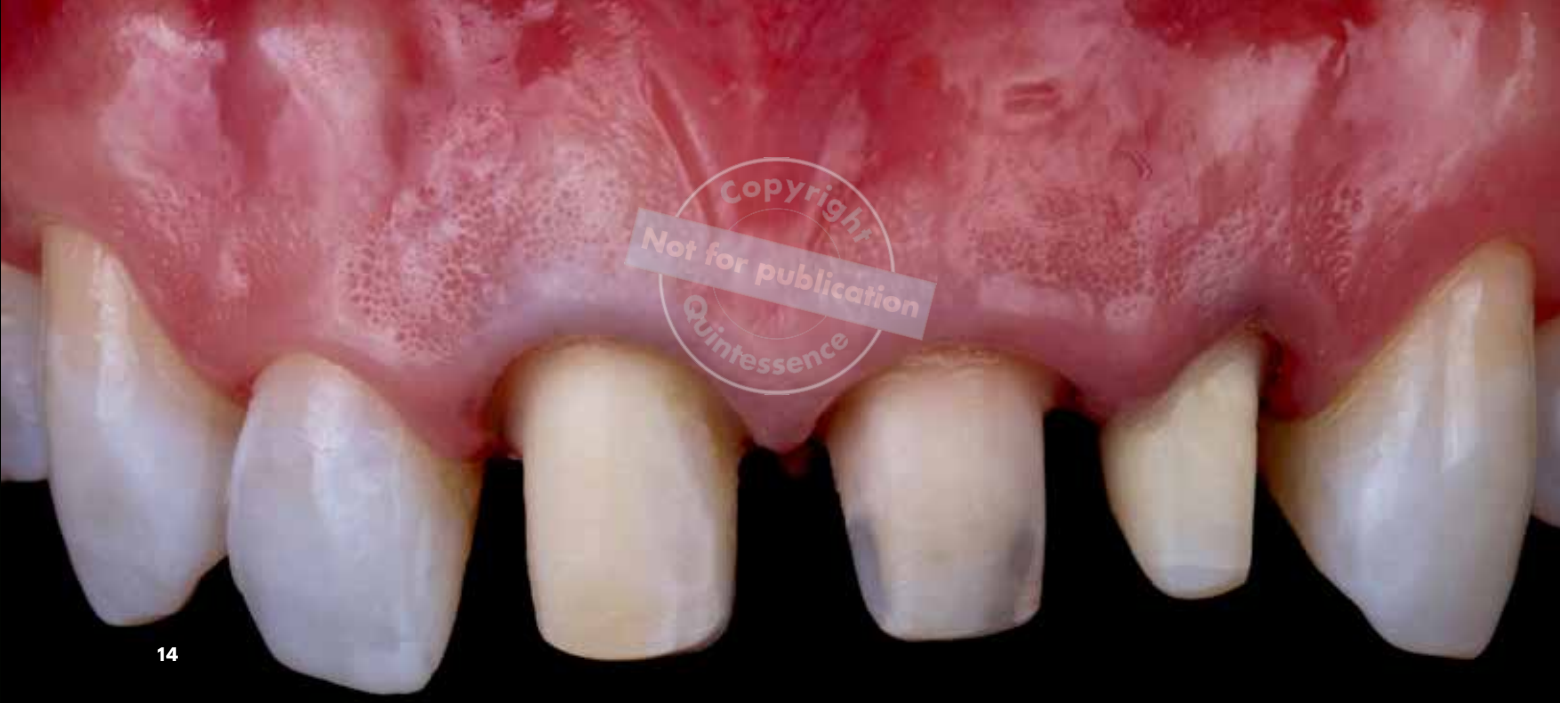


FIG 13 New core buildup.



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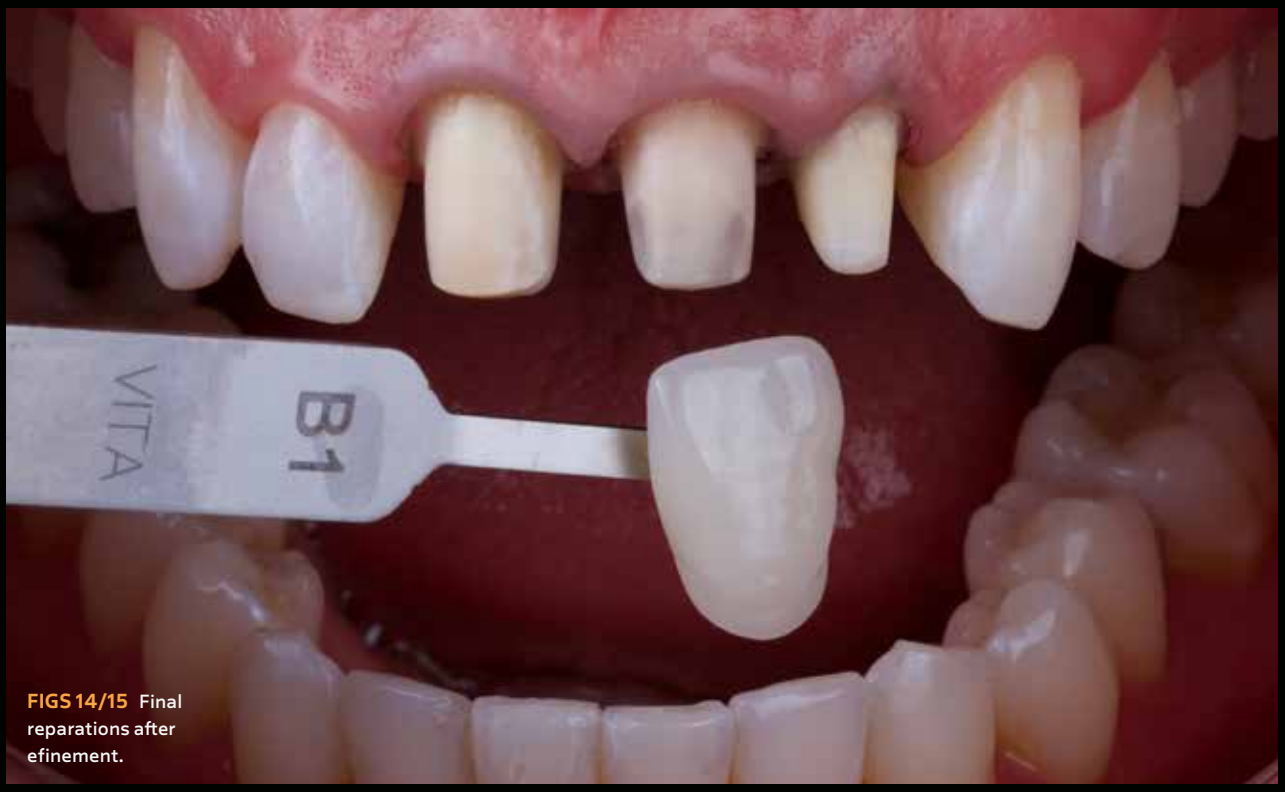
The abutment teeth were reprepared with fine-grit diamond burs at 100,000 rpm and smoothed at 8,000 rpm (Blatz/Conejo CAD/CAM Preparation System, Brasseler USA).[5] Ideal soft tissue retraction was achieved with a double cord technique: a 000 cord was inserted first, followed by a 00 cord (Ultrapak, Ultradent). The upper cord was removed for impression making while the smaller cord remained in place. Intraoral photos with the previously selected shade tab were taken to visualize the difference between the final desired restoration color and the abutment teeth color (Figs 14 and 15). A final digital impression was made and uploaded to the cloud-based folder shared with the dental technician.



FIGS 14/15 Final reparations after efinement.

FIG 16 Final digital impression.

FIGS 17–19 Restoration design with 0.4-mm facial cutback.

Laboratory Procedures

Despite the strong trend toward monolithic full-contour restorations, layered porcelain-fused-to-zirconia (PFZ) restorations may still be preferred when masking maxillary anterior teeth with endodontic treatment and/or discolored abutments, when shade matching highly characterized teeth, in cases of single anterior restorations, and in asymmetric cases where one side of the dental arch requires more restoration than its opposing side, because they offer greater flexibility in terms of masking, customization, and individual characterization. Anatomical preparation designs are essential to provide homogeneous material thickness on the cervical, middle, and incisal thirds to achieve the desired esthetic outcomes. They also facilitate the ceramist's work when manually layering the porcelain as a similar thickness in all anterior restorations is desired for better shade matching.[6,7]

Traditionally, opaque zirconia copings or frameworks were milled, followed by manual layering of porcelain to cover the entire structure. With the improvements in zirconia esthetics, PFZ restorations may have a monolithic design in the functional areas and a partial cutback on the facial area to provide space for the porcelain. This design combines the best characteristics of both methods, a monolithic functional area with a highly polished surface and the high esthetics of manually stacked porcelain in the esthetic zone.[8]

In the design software (DentalCAD, Exocad), intraoral and extraoral images as well as diagnostic and final digital impressions were uploaded. Full-contour restorations were designed, and a facial cutback of 0.4 mm was made in the buccal surface to provide space for the porcelain (Figs 16 to 19). It is important to evaluate the design after the cutback to ensure that the minimal thickness required for the selected material is respected. A supertranslucent multilayered zirconia material (Katana STML,

FIGS 20–22
Try-in sequence.

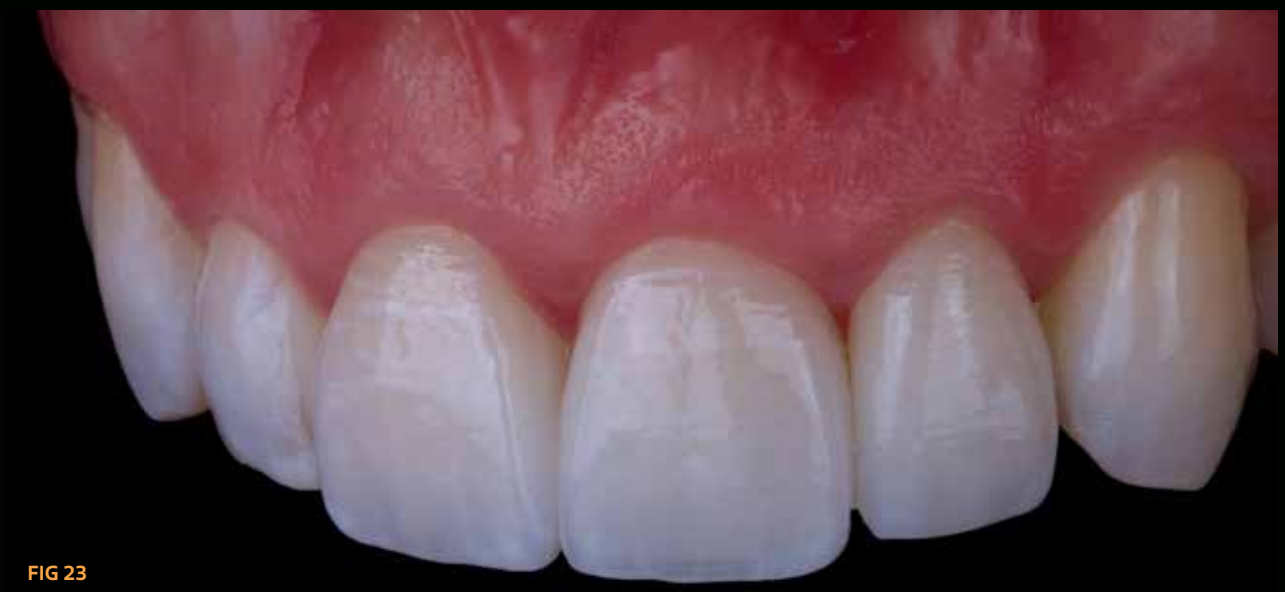
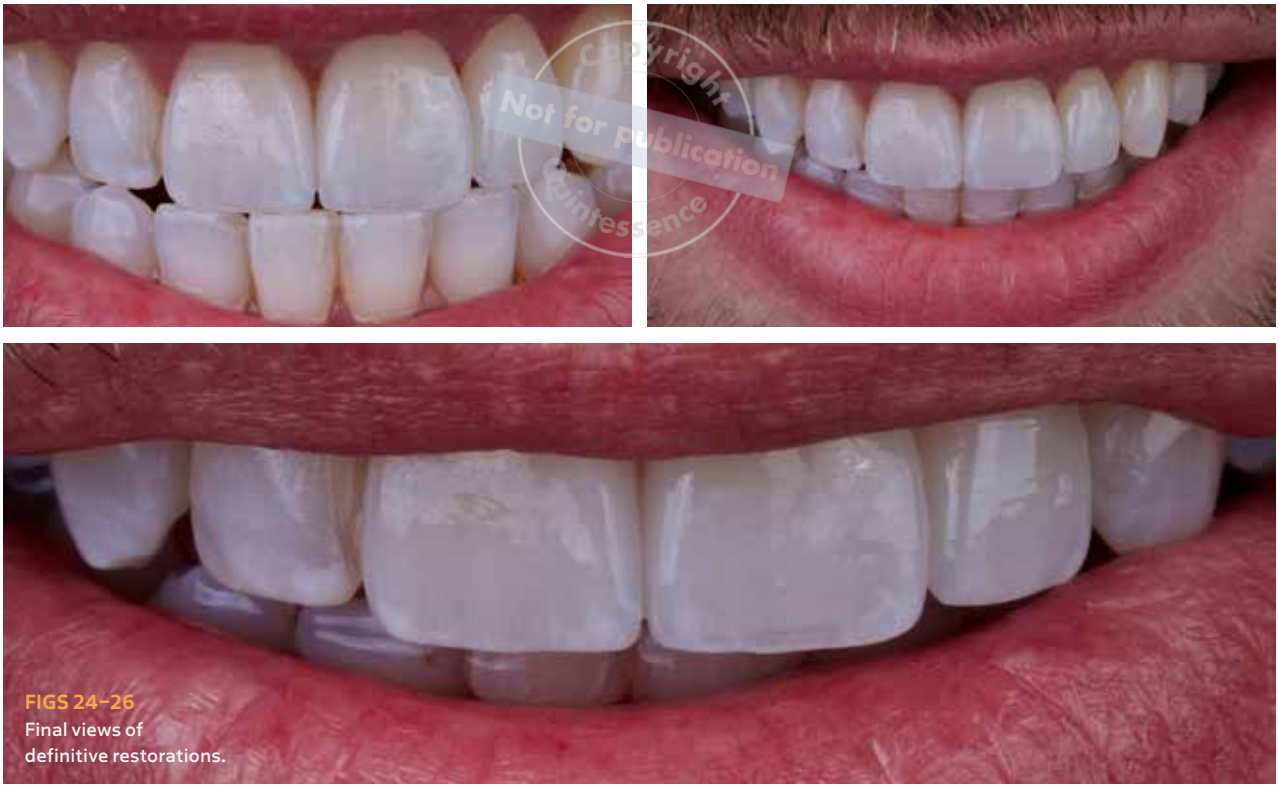


FIG 23
Final view.

Kuraray Noritake) shade B1 was used for milling the restorations with an overall minimal thickness of 0.8 mm. Its translucency is gradually decreased from the incisal to the cervical region to increase the masking level in the cervical region. A feldspathic porcelain was layered on the buccal surface (CZR, Kuraray Noritake).[9]

A try-in paste was used (Panavia V5 Try-in Paste, Kuraray Noritake) for esthetic evaluation of the restorations and to obtain the patient's approval (Figs 20 to 22). Restorations were cleaned in an ultrasonic alcohol bath for 5 minutes, followed by air-particle abrasion with 50-micron aluminum oxide particles, and inserted with a dual-cure universal resin cement (Panavia SA Universal, Kuraray Noritake) shade A2.[10–12] The combination of the B1 shade for the milled restorations with the translucent feldspathic layered porcelain effects and the A2 shade for the resin cement provides a natural warmth appearance and shade match. This shade setup mimics the natural dentition with internal chromatic dentin and a less chromatic and more translucent enamel layer (Figs 23 to 26).



FIGS 24–26
Final views of definitive restorations.

Conclusion

Monolithic restorations provide esthetic and functional results in most clinical cases. When replacing failing restorations in the esthetic zone with compromised abutment teeth, PFZ crowns with a facial cutback and a highly polished monolithic surface on the functional areas provide a viable and sometimes preferred option.[13]

A detailed treatment plan developed with the involvement of clinicians and dental technicians in the decision-making process can facilitate the desired esthetic outcome even in challenging clinical situations. The implementation of new technologies for file sharing, design, and manufacturing combined with detailed clinical and technical execution are the bases for modern restorative workflows.[14]

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