

Laboratory Realities

AESTHETIC SUCCESS WITH STATE-OF-THE-ART CERAMIC TECHNOLOGY

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The recent advent of improved porcelain powders with fluorescent and opalescent particles has resulted in the increased application of ceramic treatment alternatives. While all-ceramic modalities eliminate complications caused by the presence of opaque substructures, metal-ceramic restorations can present equally aesthetic results, provided the technician is equipped with the proper training and skill. Laboratory technicians must understand how to manipulate light, create an illusion of depth, and mimic the natural dentition using various porcelain layers. The development of proper tooth contour and surface texture can also be facilitated by the use of contemporary ceramic materials. The ability to fabricate successful, aesthetic metal-ceramic restorations has been significantly enhanced by the advent of improved equipment and materials, the discovery of different leucite crystals, highly accurate computerized furnaces, and the consistency of round quartz (rather than squared) furnace muffles. Although refined ceramic materials are available to expedite the fabrication process, proper training and communication between the clinician and technician is

essential for the development of predictable, natural, and harmonious restorations.

Patient Presentation

A 40-year-old female patient presented with gingival recession and an exposed gingival margin. Teeth #8(11) and #9(21) were treated approximately 10 years previously with thick, unaesthetic, full-coverage crown restorations that required removal and replacement. Following removal of the preexisting crown restorations, it was noted that the underlying abutments were in extreme labial version and required additional reduction. Although all-ceramic treatment options were discussed, the core materials for such restorations often require a 0.6 mm or 0.8 mm space for the subsequent layering technique, which would render the restoration “bulky.” Fabrication of the outer layer with a thin interface would result in a compromised aesthetic result. Use of a translucent core would also result in potential discoloration of the incisal area of the abutment, which would influence the final shade. Porcelain-fused-to-metal restorations were subsequently selected due to the unusual position of the teeth.



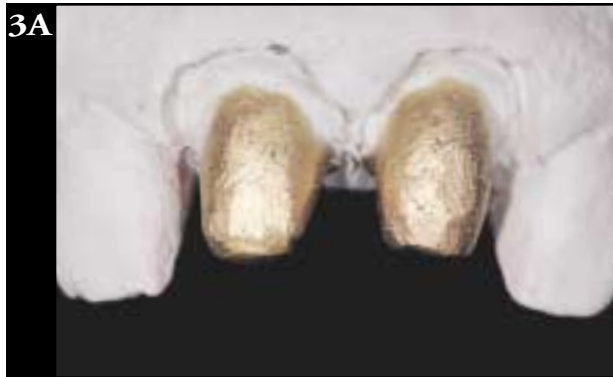
Figure 1A. Preoperative evaluation of the existing unaesthetic crown restorations demonstrated the presence of gingival recession and resultant exposure of margins.



Figure 1B. Postoperative view of the definitive metalceramic restorations (Creation, Jensen Industries, Inc, North Haven, CT) demonstrates enhanced aesthetics and harmonious integration with the soft tissues and adjacent dentition.

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Figures 2A,B,C. Due to the extreme labial position of teeth #8(11) and #9(21), additional reduction was required following removal of the preexisting restorations. Tissue retraction was facilitated using a preimpregnated cord (Stay Put, Roeko, Langenau, Germany). Care was taken during the preparation sequence not to impinge on the incisal aspect of the pulp. A polyether impression material (Permadyne Penta H, 3M ESPE, St. Paul, MN) was used for accurate capture of the soft tissue architecture and prepared surfaces. Direct provisional restorations were fabricated chairside using a cold-cure resin material (Coldpac C&B, Motloid, Chicago, IL) and placed for approximately 7 weeks to ensure maintenance of the soft tissue contours and health.

Figures 3A,B,C. The metal substructure was fabricated using the lost wax technique, an 88% high noble ceramic alloy was finished to 0.2 mm, and a gold coat (Aurofilm 2000, Metalor, North Attleborough, MA) was applied. Since smooth surfaces reflect light rather than diffusing it, an initial opaque coating was placed over the metallic substructure and covered by a second layer prepared with a rough contour. A porcelain butt margin was created to enable light transmission and to provide a vital appearance throughout the restoration and gingiva.

Figures 4A,B,C. Indentations were made with the tip of a sable brush to further enable adequate light reflection. The indentations were subsequently filled with a dentin shade (C1). Care was taken to ensure that the opacious dentin and dentin shades were the same hue (C1); some products have the same hue but a different chroma, which may result in an unanticipated and displeasing shade. While the hue of the opacious dentin and the dentin were identical, the different optical density of the materials enabled effective diffusion of light and created the illusion of depth. Although the porcelain layer was limited to a 0.4 mm depth, the opaque surface was concealed using this technique. Internal staining required proper moisture control to ensure precise placement and a degree of saturation. Dimension was subsequently added to the structural mammelons (Creation Make-In, Jensen Industries, Inc, North Haven, CT).

Figures 5A,B,C. The dentin layer was built to the final shape and contour, and a cutback was performed to provide space for the enamel and translucent layers. Once cutback was completed, internal staining and characterization were performed. Different colored enamel was layered in segments to create the illusion of depth, and translucent layers were subsequently applied.

Figures 6A,B,C. The restorations were fired at 910°C with a 1-minute hold, and refinements were made during the second bake (900°C). Contouring, surface texturization, glazing, and polishing were performed in

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the laboratory prior to the cementation phase, which was accomplished with a zinc phosphate resin cement (Flex, Mizzy, Inc, Cherry Hill, NJ). The facial 0.8 mm of the restoration demonstrated natural aesthetics and matched the natural dentition. The patient was satisfied with the aesthetic enhancement achieved with the metal-ceramic crown restorations.

Figures 7A,B,C. A 50-year-old male patient presented for treatment of the maxillary anterior region. The patient had a history of bruxism and significant parafunctional wear was observed on the maxillary central incisors and canines. The patient's periodontal condition was normal. Tissue retraction was facilitated using a pre-impregnated cord. A diagnostic waxup was prepared on the study cast and presented to the patient during the treatment planning stage. Conservative incisal reduction was used since the patient elected to lengthen the incisors; facial reduction was approximately 1.5 mm. Provisional restorations were fabricated based on the diagnostic waxup using the vacuum-form technique, and communication tools were subsequently forwarded to the laboratory.

Figures 8A,B,C. Uneven mandibular alignment also caused additional stress (though less wear) on the lateral incisors. As a result of this pattern of wear, metal-ceramic restorations (Creation, Jensen Industries, Inc, North Haven, CT) were selected for the central incisor and canine restorations, and all-ceramic restorations (Empress 2, Ivoclar Vivadent, Amherst, NY) were selected for the lateral incisors. Due to the thickness and opacified pressed core that was used to conceal the underlying abutment, the same cement material was used to secure the all-ceramic and metal-ceramic restorations.

Figures 9A,B,C. All six restorations were fabricated to demonstrate natural aesthetics and harmonious integration with the tissues and surrounding dentition. Under-exposed photographs were deliberately taken to demonstrate a value comparison. Differences were not evident in appearance, shade, value, or characterization between the restorations. Precise communication using diagnostic waxups, study models, and shade communication techniques enabled the fabrication of harmonious all-ceramic and metal-ceramic restorations. The patient was pleased with the postoperative result and aesthetic integration.

Acknowledgment

The author would like to thank Curtis Jansen, Monterey, California, for his assistance with the clinical protocol described herein.

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