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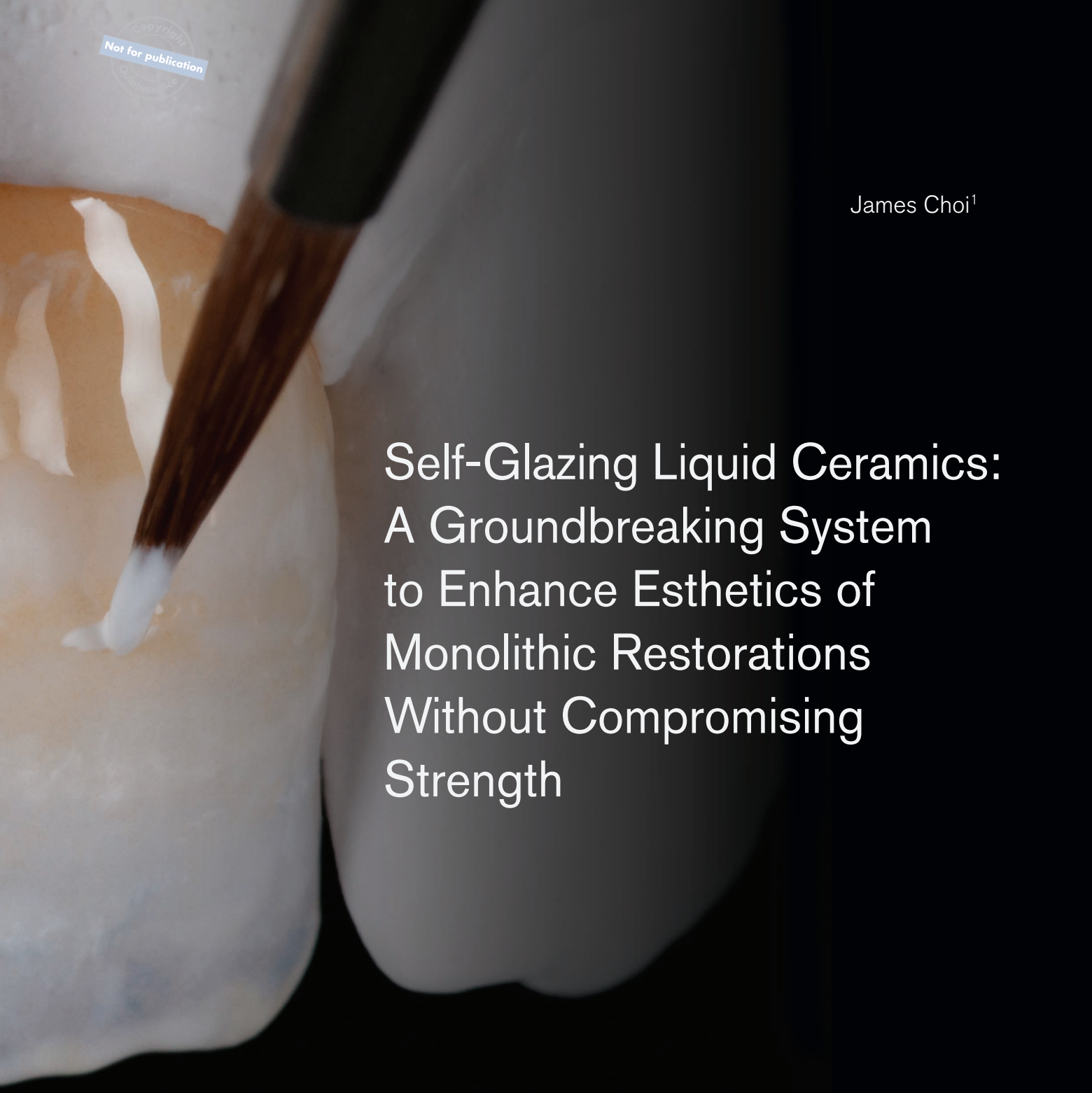


James Choi[1]

Self-Glazing Liquid Ceramics: A Groundbreaking System to Enhance Esthetics of Monolithic Restorations Without Compromising Strength

A balance between strength and esthetics is important for the longevity of the definitive restoration. While monolithic restorations provide the benefit of strength, they have limitations in terms of esthetics.

In the typical monolithic procedure, the restoration is fired after the addition of stains and again after glazing. Stains are a set of colors that are added to some areas, **built in thickness,** to achieve the saturation of color **[Au: Unsure of meaning]**. Glaze is applied when color saturation is achieved, after which another firing cycle is required. Although these procedures improve the appearance of monolithic restorations, the inability to control the surface texture during staining procedures makes it difficult to mimic nature. Another option to improve esthetics is to cut back the monolithic restoration; however, this significantly decreases the overall strength of the final restoration. For these reasons, clinicians and technicians have been limited in their ability to achieve greater esthetics without using traditional ceramic materials overlaying zirconia substructure or lithium disilicate glass-ceramic materials.

1a

1b

2

Fig 1a Milled monolithic zirconia restoration before application of liquid ceramic.

Fig 1b Monolithic zirconia restoration after application of self-glazing liquid ceramic.

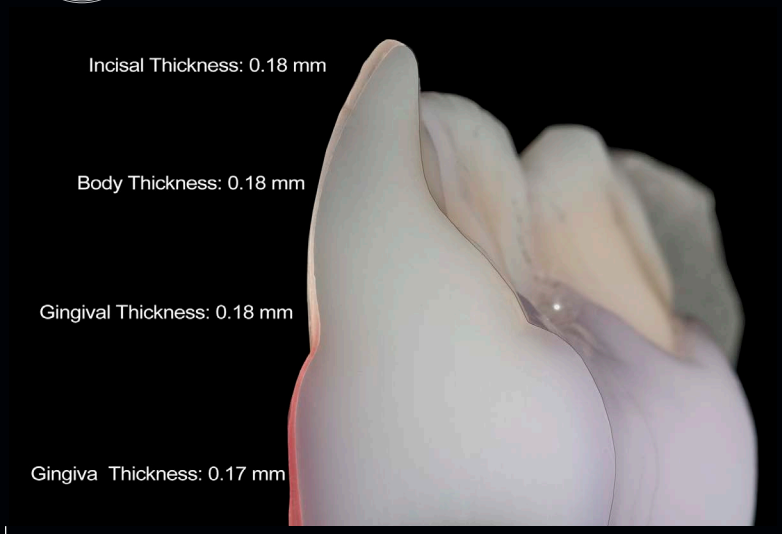
Fig 2 Surface texture created by the technician with the MiYO liquid ceramic system.

LIQUID CERAMIC SYSTEM

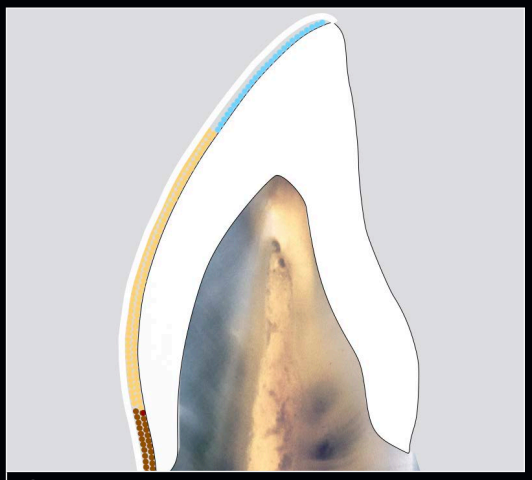
Recently an innovative self-glazing liquid ceramic (MiYO, Jensen Dental) was developed as an alternative to layered ceramics to improve the esthetics of monolithic CAD/CAM or pressed-ceramic restorations. Based on glazing material, this liquid ceramic allows tooth shade and shape modifications, accentuated character, and customization while simultaneously enhancing the surface texture of the monolithic restoration (Figs 1 and 2). The liquid ceramic creates an ultrathin ceramic layer that eliminates the need for framework cutback. This is an important factor, since the strength of the ceramics will not be modified through cutback techniques. All staining and customization can be done down to 0.1 to 0.2 mm on the ceramic surface (Figs 3a and 3b).

Different color schemes with translucent, semi-translucent, and opaque self-glazing colors were created to improve the color, shade, and shape of zirconia-based and lithium disilicate ceramics (MiYO Liquid Ceramic Color), as follows:

- *High Opacity:* Used for mamelons (Mamelon Wheat, Mamelon Coral, Mamelon Pumpkin), hypocalcifications (Snow), and pits, fissures, and stains (Fissure).



3a



3b

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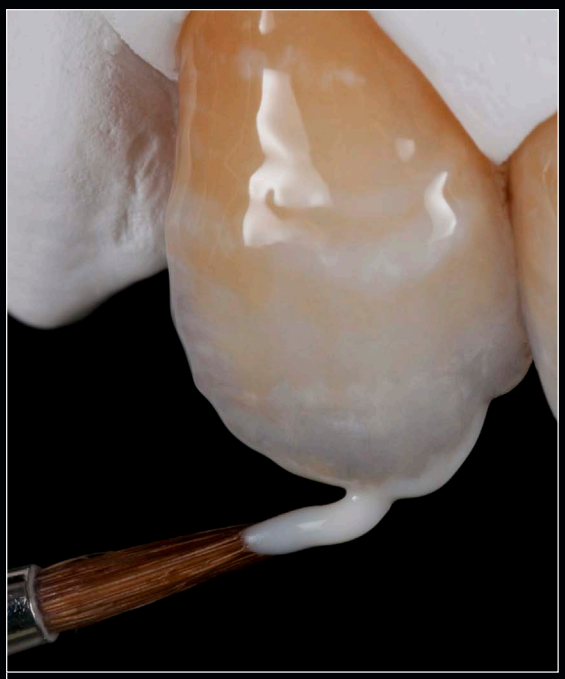
Fig 3a Sixteen colors and one structure paste were applied to the central incisor; four colors and one structure paste were applied to the gingiva. No cutback is needed to create the necessary esthetics.

Fig 3b Cross section of the central incisor.

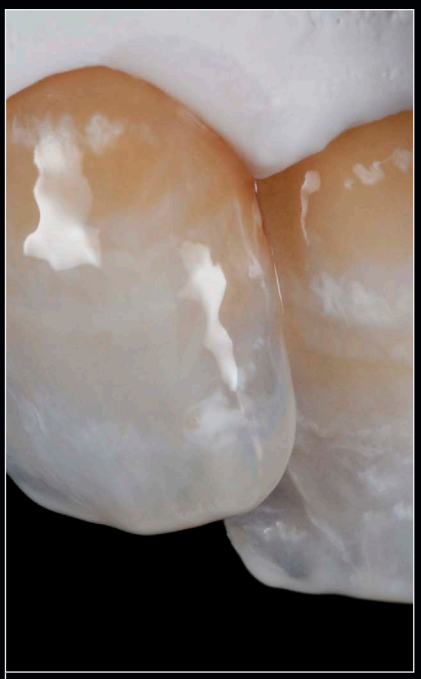
Fig 4 Desired color and glaze can be achieved with one firing.

- *Medium Opacity:* Used for incisal halo (Halo Spring, Halo Autumn) and crack lines (Linen)
- *Translucent:* Used for modification or enhancement of hue (Shade A, B, C, and D), plus other colors for incisal translucency or cervical characterization (Sage, Straw, Lotus, Clementine, Smoke, Storm, Cobalt, and Slate); Lumin and Lumin Plus can raise value without adding opacity
- *Structure:* Building materials with different translucency adding light-scattering properties to create and/or modify the restoration's shape, line angles, and surface texture detailing (Window, Enamel, Ghost, Ice, and Blush)

Self-glazing liquid ceramic allows modification of a restoration's desired color and value without adding opacity. The final outcome can be visualized before firing, allowing predictability and improved control of the esthetics of a monolithic restoration (Fig 4). The characteristics of traditional ceramic (the ability to **layer depth**) and stains (the



5a



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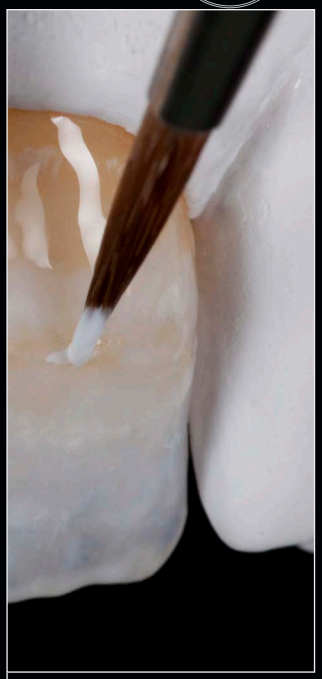


5c

Figs 5a to 5c With the liquid ceramic concept, all color is applied at one time, with the ability to **layer depth** and to see the final outcome of staining prior to firing.

Fig 6a Surface texture created prior to the firing cycle.

Fig 6b Directly after the firing cycle. Surface texture and glazing have been achieved at the same time.

Fig 7a Close-up of texture created prior to firing.

Fig 7b Close-up of texture and glaze after firing cycle.

ability to see the outcome prior to firing) have been developed in this liquid ceramic system (Figs 5 to 7).

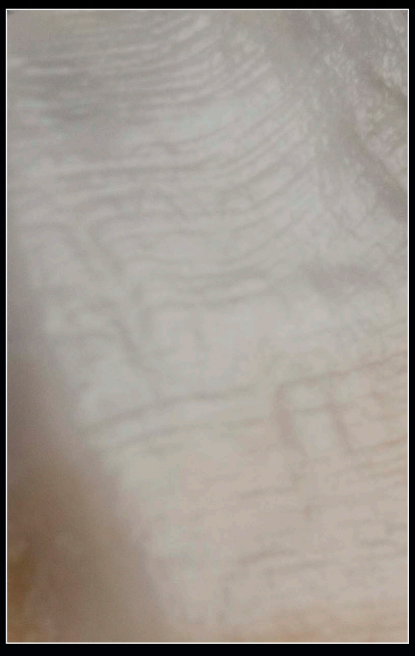
Specific self-glazing liquid ceramic colors of different translucencies and opacities were also created to improve the esthetics of gingival tissues (MiYO Pink Liquid Ceramic for Tissue):

- *High opacity* (Flamingo, Crimson, Plum, Merlot, Sorbet, Salmon, Sable, Thistle).
- *High translucency* (Midnight, Raspberry, Copper).
- *Structure* (Orchid, Rouge, Frost)
- *Glaze*

The following case describes the ease of use of this new system for monolithic restorations and the esthetic results that can be obtained.

6a

6b



7a

7b

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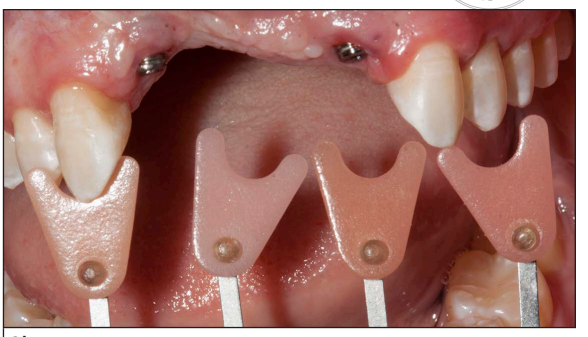
9a



9b

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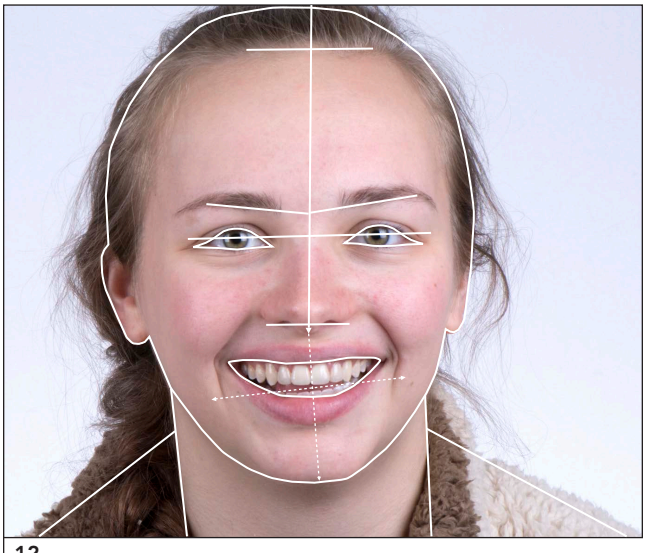

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Fig 8 Shade is taken for teeth using the mandibular anterior teeth as a reference (Dr Brian Vence).

Figs 9a and 9b Shade is taken for gingiva using the mandibular and maxillary arches as a reference.

Fig 10 First restoration finished on the model.

Fig 11 Try-in and evaluation for corrections to be made.

Fig 12 Evaluation to achieve facial balance.

CASE PRESENTATION

A 22-year-old female patient lost her maxillary incisors due to trauma (falling down stairs) at the age of 14. She went through several unsatisfactory removable denture restorations before having two implants placed in the area of the maxillary lateral incisors. Unfortunately, due to osseous and gingival tissue defects, a new restoration was required to improve the white and pink esthetics.

A provisional restoration was fabricated using polymethyl methacrylate (PMMA), and several corrections were made to serve as a template for the definitive restoration. The shade of the mandibular anterior teeth was used to create the new color scheme for the maxillary anterior restoration (Fig 8). Gingival pink shade selection was accomplished based on both the maxillary and mandibular arches (Figs 9a and 9b).

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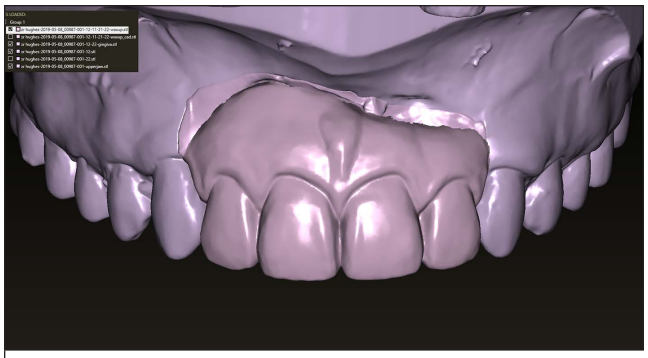

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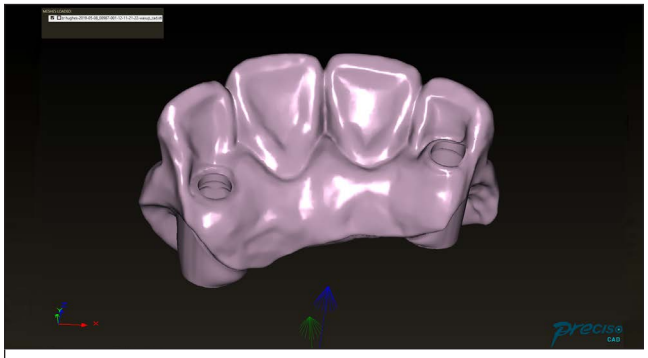

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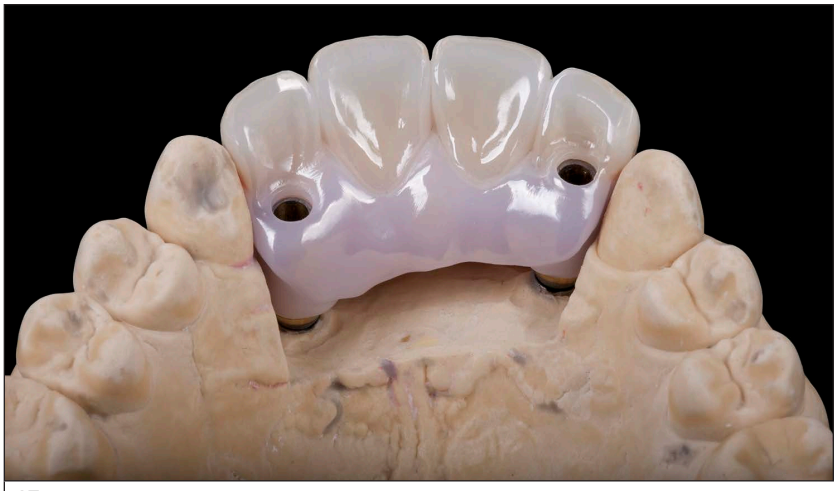
Fig 13 Correction on the wax-up (from the original scan).

Fig 14 Digital scan file of the corrected wax-up.

Fig 15 Sintered zirconia with ceramic extension on the gingival region.

Fig 16 Digital scan file of the palatal view.

Fig 17 Polished palatal functional surface.



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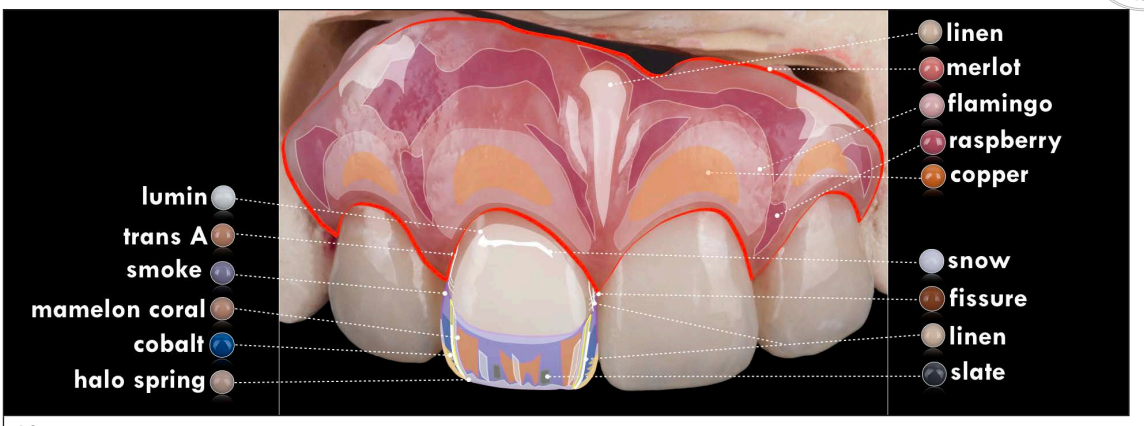
A monolithic zirconia restoration was fabricated (XT Zirconia, Jensen) and stained using the new liquid ceramic (Fig 10). The restoration was then tried in the patient's mouth and also verified with the patient's smile and face (Figs 11 and 12). The try-in revealed the need for the following adjustments: *(1)* increased coverage of gingival contour in the area of the left central and lateral incisors, *(2)* repositioning of the gingival zenith and lengthening of the incisal edges of the right central and lateral, and *(3)* slight modification of the midline.

It was decided to create a new wax-up to improve the appearance of the restorations (Fig 13). The new wax-up was scanned and a new monolithic zirconia restoration was milled (XT Zirconia, Jensen) and sintered according to the manufacturer's instructions (Figs 14 to 17). No cutback was performed on the zirconia framework, allowing the new



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19a

19b

20a

20b

21a

21b

Fig 18 Schematic showing the liquid ceramic colors applied.

Figs 19a and 19b After application of *(a)* liquid ceramic colors and *(b)* structure paste to create surface texture.

Fig 20a Final outcome photograph (with no filters on camera) to evaluate all esthetic details.

Fig 20b Cross-polarized photograph.

Fig 21a Dynamic photograph to evaluate surface texture of the restoration compared to the surrounding natural dentition.

Fig 21b Cross-polarized photograph at dynamic angle to evaluate esthetic details.

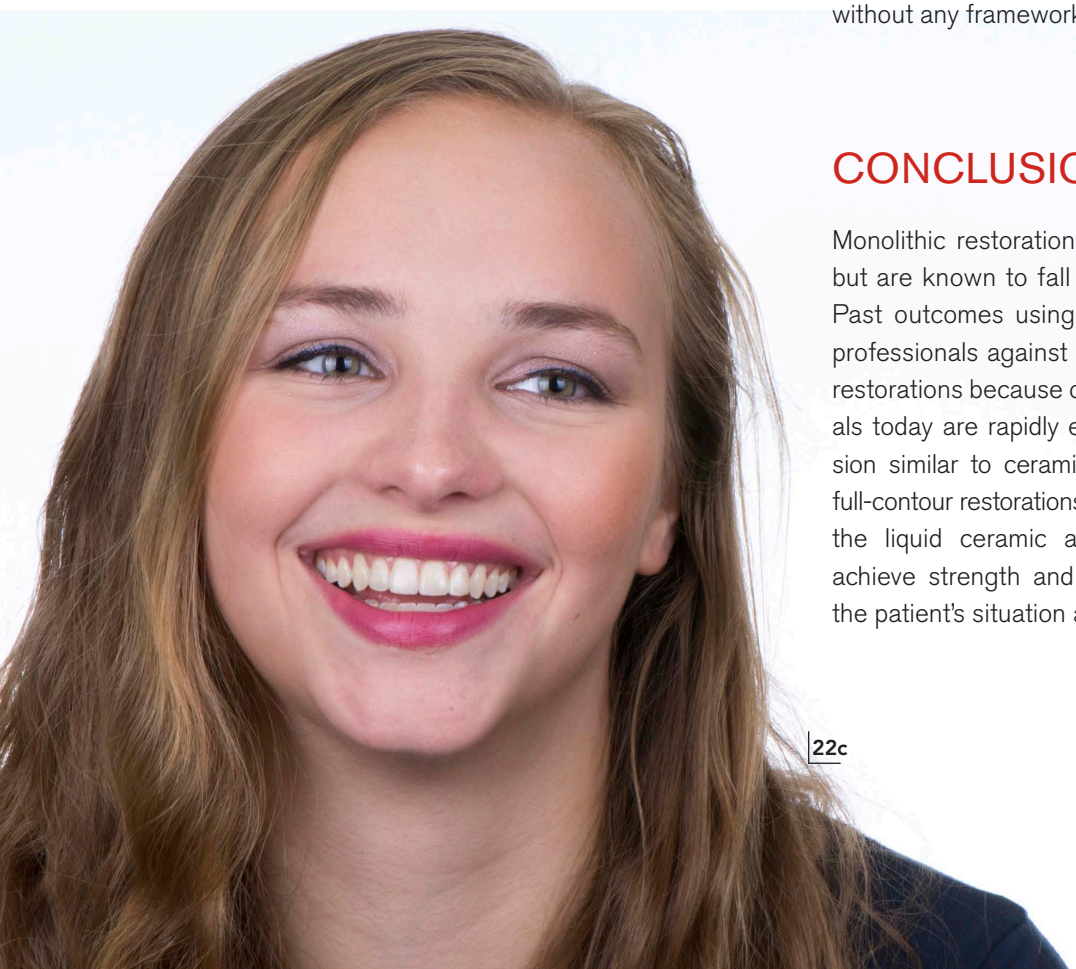
22a

22b

Figs 22a to 22c Facial balance is achieved. Facial asymmetry needs to be evaluated by both the dental clinician and technician prior to fabrication of the restorations to successfully balance the smile with the facial structure as a whole.

ceramic extensions to better blend into the patient's gingiva. The restoration was then characterized using liquid ceramic (Figs 18 and 19) and fired as recommended by the manufacturer.

The final outcome revealed natural esthetics similar to what could be achieved with layered ceramics but without any framework reduction (Figs 20 to 23).



22c

CONCLUSION

Monolithic restorations provide the benefit of strength but are known to fall short in terms of their esthetics. Past outcomes using "white gold" have biased dental professionals against the use of full-contour monolithic restorations because of their esthetic limitations. Materials today are rapidly evolving to manage light transmission similar to ceramic systems. Mimicking nature with full-contour restorations now appears to be possible with the liquid ceramic approach, offering a solution to achieve strength and esthetics without compromising the patient's situation and esthetic demands.