

COVER STORY



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INTRODUCTION

A life-changing impact can be made on our patients' lives with simple, minimally invasive cosmetic dentistry. In the case discussed here, a smile was transformed from "embarrassing" to stunning with whitening, gingival recontouring, and restoration of six maxillary anterior teeth with minimally prepared indirect porcelain veneers.

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PATIENT HISTORY

The patient, a 30-year-old mother of two young sons, had been unhappy with her teeth for more than a decade. Tetracycline staining affected most of her teeth. The enamel of many of her anterior teeth had suffered decalcification during orthodontic treatment, and a bicycle accident resulted in damaged incisal edges of her central incisors. A previous dentist had treated her maxillary central and lateral incisors with direct composite veneers, which gradually broke down over time. Fortunately, that dentist completed the treatment with little to no removal of tooth structure. Nevertheless, the patient had been embarrassed to smile for many years and wondered why her teeth could not look as nice as other people's (Fig 1).



Figure 1: Preoperative facial view.

EXAMINATION, RECORDS, AND CO-DIAGNOSIS

OCCUSION

The patient's goal was simply to "fix my smile." In this case esthetic dentistry was an easy sell, but significant effort was invested in helping the patient to understand and appreciate the functional requirements that make beautiful dentistry last.

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A thorough examination included evaluation of the temporomandibular joints, masticatory musculature, and occlusion; these revealed Piper Class I joints, normal comfortable musculature, and some undesirable occlusal contacts due to the absence of good anterior guidance.¹ Her teeth contacted prematurely in the left posterior in centric relation (CR) and her mandible slid forward and vertically by approximately 1 mm as she squeezed her teeth into maximum intercuspation (centric occlusion). This typical occlusion can be duplicated with mounted

study casts with extreme precision using an E-tab CR bite registration as described by Dr. Jimmy Eubank.² Along with impressions for study casts and an Artex facebow (Jensen Industries; North Haven, CT), the relationship between upper and lower arches in CR was precisely duplicated on an Artex articulator.²

Fabrication of an E-tab involves temporary bonding of composite resin to upper and lower anterior teeth. The lower bead of composite resin becomes a central bearing point placed on the incisal edges of the central incisors. The upper portion is built into a flat plane on the central incisors, placed so as to receive the central bearing point of the lower.

Using bimanual manipulation in CR, a repeatable point of contact can be found for most patients. This closed position was recorded for this patient using Blu Mousse bite registration material (Parkell; Edgewood, NY) and was verified to be accurate when, upon removal from the mouth, a well-defined hole in the registration material was visible without excess flash of material where the central bearing point meets the upper plane. Dr. Eubank

calls this successful bite registration a "zero-flash bite."²

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An accurate representation of the actual clinical occlusion allows for a thorough analysis of the current occlusal scheme, as well as predictable treatment planning for occlusal correction through trial equilibration and diagnostic work-up on mounted casts. This level of attention to function is important to predictable long-term comfort and stability of the case; therefore, time was taken to discuss these principles with the patient during the process of examination and record taking. This process of co-diagnosis, first described by the late Dr. Bob Barkley,³ is paramount to comprehensive treatment acceptance and creation of a healthy, collaborative relationship between dentist and patient.

BIOLOGY

A full series of radiographs was taken and all hard and soft tissues of the mouth were evaluated. Full-mouth periodontal pocket-depth measurements were recorded, with



Figure 2: Before and after smile.



Figure 3: Before and after retracted view.

special attention to the exact sulcus depths of the maxillary anterior teeth. This portion of the examination yielded no significant findings and little evidence of risk involving biologic systems.⁴

ESTHETICS

A full series of photographs was taken with a D-200 camera (Nikon; Melville, NY) and Commander flash system (Nikon). The photographs, along with other records and data, were reviewed with the patient at a subsequent appointment. During this review, smile-design concepts were discussed, educating the patient so that she could become more

involved in the planning of her treatment. The following esthetic problems were noted:

- asymmetric smile-line (the incisal edges of the maxillary anterior teeth did not parallel the upper border of the lower lip)
- uneven gingival display (the gingival zeniths of #7 and #8 did not match those of #9 and #10)
- uneven tooth-size proportions (the lengths of the right anterior teeth did not match those of the contralateral teeth)

- excessive width-to length ratios
- diastema between the central incisors
- color and morphology of enamel (tetracycline staining, decalcified enamel, incisal chipping, and failing composite restorative material) (Figs 2 & 3).

The patient wanted to solve these problems and do so with minimal invasive dentistry, long-lasting results, and reasonable financial investment. Options of whitening, and direct and indirect veneer options were reviewed and a plan of treatment was agreed upon.

TREATMENT PLAN

The treatment plan was as follows:

- deep bleach whitening
- equilibration
- gingivectomy #7, #8
- indirect porcelain veneers ##6-11.

TREATMENT

WHITENING

To diminish as much of the anti-biotic staining as possible, we chose an aggressive whitening treatment. The deep bleaching technique, as described by Dr. Rod Kurthy,⁵ was used. It involves specific fabrication of trays designed to hold bleaching gel in contact with target enamel overnight; a one-hour clinical whitening with Aquabrite 16% hydrogen peroxide gel (Aquamed Technologies; Chicago, IL); followed by 14 consecutive nights wearing the gel-filled trays; and, finally, another half-hour of clinical whitening. Each application of whitening gel was preceded and followed by application of Aquaseal desensitizing agent (Aquamed) containing hydroxy ethyl methacrylate, fluoride, and benzalkonium chloride. The treatment resulted in several shades of difference in value and chroma content and helped minimize the need for heavier reduction in order to block color with the restorations.

TISSUE RECONTOURING

To create symmetry among the gingival zeniths of the patient's anterior teeth, a "gum-lift" was needed for teeth #7 and #8. Periodontal sulcus depths at the height of contour of the facial tissue margins of those teeth measured approximately 2.5 mm. This allowed for 1.5 mm of marginal tissue removal, leaving

a 1.0-mm sulcus depth, which both satisfied the desired tissue heights and did not violate the biologic tissue attachment complex. Therefore, removal of osseous crest was not needed in order to gain healthy, stable soft tissue margins in the area.⁶ The gingivectomy was accomplished using electrosurgical excision (Sensimatic Electrosurge 500SE, Parkell), being careful to avoid removal of interdental tissue comprising papillae.

TOOTH PREPARATION

For over five decades we have known that bond strengths to enamel are significantly greater than that to dentin.⁷ Conversely, a minimal amount of reduction is almost always required to facilitate placement of bonded porcelain restorations, and their long-term integrity requires the need for a sufficient and homogeneous ceramic thickness to provide the restoration with some intrinsic mechanical resistance.⁸ With these two opposite parameters in mind, the diagnostic work-up of the desired length and contours of the final restorations is critical in maximizing both enamel bonding and porcelain thickness. In this case, two Sil-Tech putty (Ivoclar Vivadent; Amherst, NY) molds were made from the diagnostic work-up. One was used for fabrication of provisionals and one was cut back as a preparation guide. The preparation guide was used to help provide for minimal and uniform space for porcelain while concomitantly minimizing the need for reduction of enamel.

Marginal preparation was extended right to the gingival margins. Ultrapak size 000 retraction cords (Ultradent; South Jordan, UT) were placed subgingivally, and the margins were further extended by .10 to .25 mm apically.⁹ A second set of Ul-

trapak size 00 retraction cords was placed to provide for lateral retraction and was subsequently removed for two reversible hydrocolloid impressions (VanR; Oxnard, CA). These impressions were immediately poured with Resin Rock (Whipmix; Louisville, KY) die stone.

Provisionals were fabricated directly with shade B05 Protemp Garant (3M ESPE; St Paul, MN), relined as needed, trimmed, polished, and bonded using a spot-etch technique.

The patient tested the provisionals for several days and returned for a crucial appointment. At this visit, the patient was asked to critically evaluate the provisional, providing feedback regarding esthetics, speech, and comfort. Adjustments were made and the provisionals were recorded with a series of photographs, an impression, and facebow. The lower working cast was mounted against the upper facebow-mounted provisionals, offering the best representation on the articulator of the clinical provisionals for the technician's most predictable ability to provide an appropriate smile line perpendicular to the long axis of the patient's face.

Vita shade OM1 (Vident; Brea, CA) was selected as the basic intended shade for the final restorations, although a color gradient, as described by Dr. Jim Fondriest,¹⁰ ranging from OM1 in the incisal thirds of the centrals and laterals to A1/A2 in the cervical and interproximal of the canines, was color-mapped and discussed with the technician.¹⁰

LABORATORY

Esthetic pressed ceramic (Ivoclar Vivadent) was used to fabricate the veneers. Shade EO1 ingots were pressed to full contour restorations and then cut back and built back with layering porcelain, enabling



Figure 4: Note marginal tissue health and blending of final restorations with surrounding dentition.



Figure 5: Postoperative full-face view.

all color and characterization to be contained internal to the restorations.

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DELIVERY

The provisionals were removed and all residual composite resin cement was removed with a high-

speed smooth diamond bur. The restorations were tried in and the patient was able to view and accept them.

The internal surfaces of the restorations were etched with 10% hydrofluoric acid for two minutes, rinsed, dried, and placed in an ultrasonic bath with 95% alcohol for five minutes. This enhanced mechanical retention by removing ceramic residue and remineralized salts after etching. The internal surfaces were then treated with Silicoup

silane (Heraeus Kulzer, Armonk, NY).¹¹ The veneers were bonded using Uni-etch 37% phosphoric acid with benzalkonium chloride (Bisco Products, Schaumburg, IL), etching for 30 seconds, followed by rinsing, application of dentin primer (All-bond 2, Bisco), unfilled resin, and cementation with Variolink translucent shade composite cement (Ivoclar Vivadent). All surfaces were cured for at least 60 seconds with an Optilux 501 curing light (Kerr/Demetron; Orange, CA), and excess

cement was removed. The occlusion was refined and the patient excused (Fig 4).^{12,13}

CONCLUSION

This was a simple case when it came time to execute the treatment. But it was careful planning, adherence to proven protocols, and collaboration with the patient that made the case so simple and successful. The patient gained the confidence to smile that she had not had for so long, changing her life for the better; and the case was done with minimally invasive, predictable dentistry (Fig 5).

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