

Careful Planning to Replace Congenitally Missing Teeth

Using Hybrid Restorations to Complete a Smile Makeover

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Abstract

Our responsibility as dentists is to identify the appropriate solutions to meet our patients' needs and goals while giving them the best possible level of care. Sometimes, what is deemed the standard of care is incompatible with a patient's most significant needs and desires. For example, the standard of care for replacing congenitally missing incisors surrounded by healthy teeth is placing an implant-supported restoration. However, for any number of reasons—including time constraints, economic issues, and biological factors—some patients may adamantly refuse this treatment in favor of a three-unit fixed restoration. Regardless, properly planned and well-executed esthetic restorative dentistry incorporating three-unit bridges in the anterior sextant can profoundly influence our patients' lives in both tangible and intangible ways. This article details the treatment planning and restorative decisions undertaken to restore the smile of a patient with congenitally missing anterior teeth.

Key Words: Smile design, gingival recontouring, occlusion, authentic leucite-reinforced pressed ceramic technology, hybrid restorations, three-unit fixed restorations, esthetic functional restorations



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Figure 1: Preoperative full-facial image revealing missing lateral incisors and gummy appearance.

Introduction

As dentists, we are often placed in the difficult position of providing our patients with the most advantageous outcomes based upon their individual needs while simultaneously incorporating principles of minimally invasive dentistry. Patients desire solutions that are fast, reliable, and long-lasting regardless of the complexities that their condition may present. Our responsibility is to identify the appropriate solutions to meet our patients' needs and goals while giving them the best possible level of care.

In addition to minimally invasive treatments, smile design principles also dictate the techniques and procedures required. While research shows esthetics are generally a matter of personal opinion, patients demand restorative work that appears natural and is esthetically pleasing.¹ Smile design principles and esthetics have evolved as dentistry transitions from aggressive tooth preparation to preserving and building upon natural tooth structure. Therefore, reducing natural tooth structure is minimized in favor of augmenting the natural teeth through smile design principles that emphasize augmentation and tensional integrity when designing crown and bridge restorations.²

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Multidisciplinary procedures, such as reconstruction of the maxillary anterior segment, generally necessitate a combination of treatment options to achieve optimal esthetics, function, and comfort.³ After tooth extraction, the interproximal papillae recede and the buccal bone collapses. This presents the challenge of restoring an edentulous space in the esthetic zone. A viable nonsurgical option is placing a temporary bridge with an ovate pontic at the time of extraction to support the proximal papillae, facial soft tissue, and healing gingival tissue.⁴ Another option is resin-bonded bridges.⁵ Research shows that resin-bonded bridgework has an 84 percent success rate.⁶

Porcelain materials used in combination with improved bonding materials and techniques enable the realization of conservative esthetic restorations fabricated without the need for metal substructures, facilitating smile design principles involving optical properties, light reflection, and gingival health.⁷ When replacing missing maxillary anterior teeth, a difficulty that arises is concurrently providing an improved tooth-to-soft tissue relationship, regardless of whether the restorative modalities are implants, naturally supported fixed bridges, or removable partial dentures. To achieve esthetically harmonious soft tissue architecture when a high gingival smile line is present, reestablishing the interdental papillae is essential. Careful planning and proper communication with the patient regarding these issues is necessary for thorough understanding and educated consent to treatment, as well as clinical and esthetic success.⁸

Typically, the standard-of-care treatment for missing teeth—especially when the teeth on either side of the space are intact and restoration-free—has transitioned to implant-supported crowns. However, there are circumstances that may require dentists to treatment plan an esthetic fixed three-unit restoration. These include the need to restore the adjacent teeth, limited bone in which to place an implant, and/or a patient's desire for quick and predictable treatment without procedures that require ongoing healing and repeat visits.

In the case discussed here, the patient first presented at our office nearly five years ago. She had recently completed orthodontic therapy and was seeking a solution for her congenitally missing lateral incisors, mottled tooth discoloration, overjet, and occlusal issues.⁹ After the initial consultation, the patient and her parents discussed all of the issues with her smile and the need to complete treatment within a limited time frame. It was mutually decided that two fixed three-unit Authentic-pressed-to-metal “hybrid” bridges (Jensen Dental; North Haven, CT) would be used to replace the lateral incisors and create a more pleasing proportion for

esthetics.¹⁰ Authentic veneers were also selected to complete the required 10-unit restoration.

Case Presentation

An 18-year-old female presented with a chief complaint about congenitally missing lateral incisors (**Fig 1**). Shy and quiet, she attributed her reserve to her unesthetic smile. Having recently completed orthodontic therapy, she wanted to close the spaces between her teeth. Because she would be leaving for college at the end of the summer and wanted an immediate solution, the time frame for completing her restorations could not exceed three consecutive months. As implant restorations can take up to six months (factoring in healing time), they were deemed inappropriate for this patient based upon her personal needs.¹¹

Diagnosis

After a standard clinical examination, it was apparent that the patient exhibited occlusal defects, including a lack of stable centric stops on the cuspids and central incisors (**Fig 2**). Aside from esthetically obvious congenitally missing lateral incisors, there was generalized discoloration of her teeth and a distinct morphological difference between the uneven, mottled central incisors. The patient also displayed mild decalcification and enamel dysplasia. The patient's cuspids and bicuspid were relatively short, causing a somewhat "gummy" appearance that was especially evident during a broad smile; this would require some gingival reduction (**Fig 3**). Lastly noted, the ridge thickness was inadequate for placing implants in the correct three-dimensional positions unless soft tissue and/or bone augmentation was implemented. Unfortunately, these requisites would result in overall treatment and healing time surpassing the three-month time limit the patient had established.

Treatment Planning

Several treatment options were discussed with the patient regarding replacing the congenitally missing lateral incisors. These included single-tooth implants, removable prostheses, conventional fixed or cantilever prostheses, Maryland bridges, and orthodontic repositioning of the canines to close the edentulous areas. The advantages and shortcomings of each treatment alternative, both from an esthetic and practical standpoint, were discussed. This discussion addressed the tooth reduction usually associated with conventional fixed prostheses. In this particular case, the necessary osseous grafting and ridge augmentation required to render each edentulous site "implant-ready" also were discussed.

During the co-discovery and co-diagnostic process, it became apparent that the patient displayed at least 10 maxillary teeth when smiling broadly. Among those 10 teeth were the four discolored anterior teeth, two of which were uneven and had caries beneath a bonded wire retainer, and all four of which were out of occlusion, having no stable centric stops at all.



Figure 2: Close-up retracted preoperative image showing uneven central incisors and gingival prominence.



Figure 3: Preoperative image of the patient in natural smile, revealing the gummy appearance of the excess gingival tissue.

“The patient understood and acknowledged the distinct necessity for functional as well as esthetic restoration of all four anterior abutment teeth, as well as removing caries during the restorative process.”

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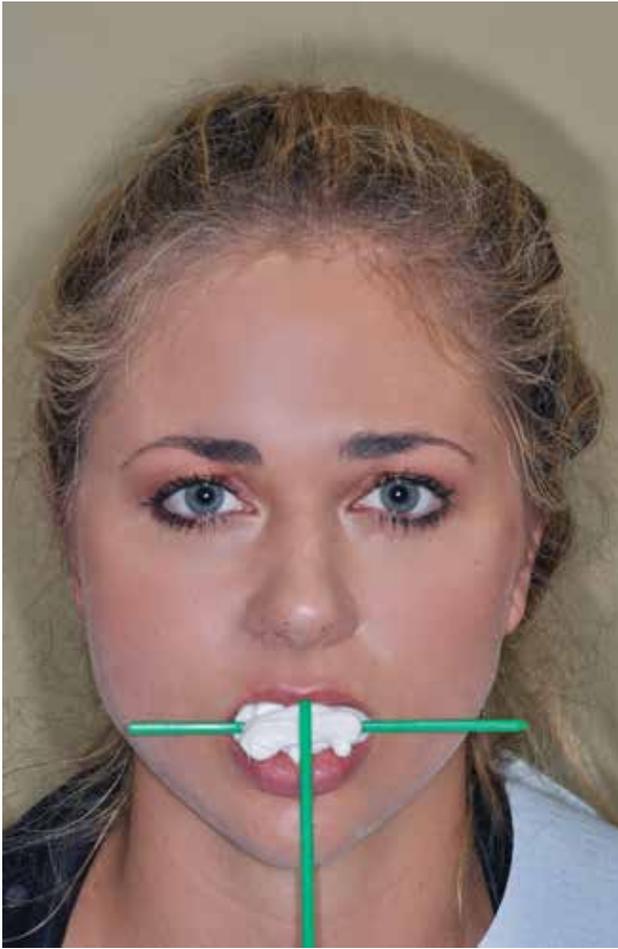


Figure 4: A stickbite was taken to facilitate identification of the patient's midline and smile line.



Figure 5: Retracted view of the patient's gingival tissues following gingival recontouring procedures.

The patient understood and acknowledged the distinct necessity for functional and esthetic restoration of all four abutment teeth, as well as removing caries during the restorative process. She also understood the added benefit of maintaining a healthy long-term orthodontic retention. Therefore, the patient opted to replace the lateral incisors in conjunction with the esthetic/functional restoration of the anterior sextant utilizing two conventional three-unit fixed bridges.

Ovate pontic designs were chosen for teeth #7 and #10, not only for hygienic purposes, but also to create the illusion of natural teeth with normal emergence profiles. A gradual sloping transition of the porcelain from beneath the tissue, accompanied by mild compression toward and into the interproximal areas, would facilitate the formation of "pseudo" papillae, which further increased the esthetic qualities of each bridge.

The Authentic Pressable Ceramic System would be utilized to optimize function and strength without sacrificing esthetics. The bicuspid would receive Authentic veneers to complete the 10-unit smile transformation.

Procedures and Protocol

An initial wax-up on a diagnostic model was created from a vinyl polysiloxane (VPS) impression (Imprint II, 3M ESPE; St. Paul, MN), using a preoperative stickbite and stickbite photographs as a guide for the patient's midline and smile line (Fig 4). Pontic sites were scored on the model and excavated approximately 1.5 mm to 2 mm to help in determining how much of the pontics could be compressed down onto the tissue. The pontic sites were waxed to ideal contour with properly positioned gingival zeniths. A Sil-Tech (Ivoclar Vivadent; Amherst, NY) putty matrix was then formed and fabricated from the initial wax-up.

Gingival recontouring was accomplished around teeth #4-13 to lengthen the cuspids and bicuspid, and to achieve harmonious symmetry of the surrounding gum tissue above each tooth. The patient was anesthetized with Citanest Plain (Dentsply Pharm.; York, PA) and Septocaine (Septodont; Lancaster, PA). Type I esthetic crown lengthening/gingival recontouring was accomplished via radiosurgery to create ideal gingival margin locations while simultaneously avoiding the violation of biologic widths (Fig 5).

The pontic socket depression was established with radiosurgery and surgical diamond burs. To evaluate the feasibility of ovate/semi-ovate pontic sites, additional bone sounding was accomplished in the edentulous areas of #7 and #10 while the patient was anesthetized to determine the thickness of the respective soft tissue layers and proximity of the underlying alveolar bone beneath each pontic. Each wound was treated with tincture of benzoin and myrrh.

The teeth were prepared by strictly adhering to requirements that would allow for adequate pressed material thickness, maximum potential strength, and esthetics of the bridges and veneers. It was imperative that adequate room for strength be considered. Caution was



Figure 6: A photograph of the preparations was taken with the shade guide.

taken to avoid sharp internal line angles and undercuts, while maintaining shoulder preparations with butt joint margins for abutments and deep chamfers for the veneers.

Incisally, the preparations approximated a 2-mm reduction from the planned final crown length. The two-plane facial surface reduction was .8 mm to 1 mm in the cervical one-third, and approximately 1.2 mm to 1.5 mm in the incisal two-thirds of the crown. A minimal taper of an estimated 10 degrees was targeted. Because all four of the anterior teeth were previously 1.5 mm to 2 mm out of occlusion, sufficient room for the planned hybrid framework and a lingual clearance of 1.5 mm was easily preserved in centric contact areas.

A base shade of Chromoscope 030 (Ivoclar Vivadent) was chosen as the final shade for the pressed ceramic restorations. The BOO+ ingot was selected for this particular case because it contains a small amount of opacity yet retains its depth of color and fluorescence. A photograph of the preparations with a preparation shade guide (ND2) was taken and sent to the laboratory (Fig 6).

A final bite registration was made with a super-rigid VPS bite registration material (Mega Bite, DenMat; Santa Maria, CA), as well as a final stickbite registration using a medium-viscosity VPS bite registration material (Vanilla Bite, DenMat) and a Benda Brush handle (Centrix; Shelton, CT). A stickbite photograph was also obtained.

A final impression was made using heavy and light body materials (Imprint). Tissue retraction was accomplished using a combination of a temporary gingival retraction system (Expasyl, Kerr; Orange, CA)

and tiny, isolated segments of a very thin, braided retraction cord (Gingi-BRAID+ 0a, DUX Dental; Oxnard, CA).

The provisional restorations were created using a composite resin in shade Bleach White (Integrity, Dentsply Int.; Milford, DE) and were patterned after the wax-up by using the Sil-Tech putty matrix. Renamel flowable microfill composite (Cosmedent; Chicago, IL) was used to refine the pontics and the margins of the temporaries. The composite was added incrementally to create the compression into the tissue. The provisional bridges were tried in to confirm a slight amount of positive pressure in the pontic areas. The provisionals were glazed (BisCover LV provisional glaze, Bisco; Schaumburg, IL) and cemented with a provisional cement (TempBond NE, Kerr).

The occlusion and contours of the temporaries and pontics were refined, and the patient's speech patterns and phonetics with the temporaries were assessed and confirmed. Smile design and color schematics were revisited to ensure the esthetics would satisfy the patient's requirements. Photographs, a bite registration, and a stickbite were taken of the temporaries to be sent to the laboratory along with a detailed prescription and checklist. This included preoperative and provisional photographs, along with preparation shade photographs, stickbite and stickbite photographs, preoperative and provisional models, original wax blueprint, provisional bite registration, trimmed wafer-thin master bite registration, master impression, and opposing master impression.

Laboratory Fabrication

The Authentic Pressable Ceramic System was selected to optimize function and strength without sacrificing esthetics. There was a two-fold advantage of using this leucite-reinforced pressed ceramic technology. First, it is kind to the opposing natural dentition; and, second, it demonstrates a uniform optical refractive index in the mouth, even with mixed media cases. An additional attribute of Authentic is its superior biocompatibility. This case translated into a strikingly natural, vital smile that exhibited the "pop" all dentists seek and discriminating patients desire.

Additional steps were taken at the laboratory when fabricating the bridge restorations to ensure strength and to optimize the natural beauty, subtle nuances, and translucence in the anterior sextant. As opposed to a solid metal framework with typical abutment copings, a "hybrid framework" was fabricated for each "not-so-conventional" bridge (Fig 7).

This unique hybrid framework was perforated and embedded into the wax-up from the lingual aspect to ultimately incorporate strength and stability within the pressed ceramic material without compromising the beauty of the underlying tooth structure (Fig 8). Not only would natural light be able to pass through the framework, but light curing and complete polymerization of the adhesive luting cement would also be assured (Fig 9). The final result was a beautifully crafted, metal-reinforced pressed ceramic bridge that would facilitate light transmission.

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Figure 7: Hybrid framework prior to opaquing, with “tail” attached to facilitate handling of the framework and bridge during fabrication in the laboratory.

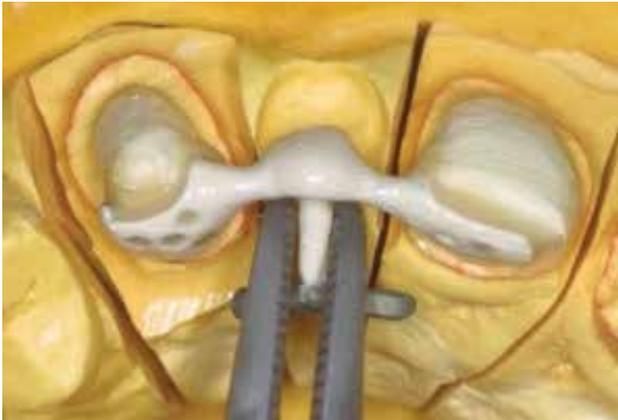


Figure 8: Adapting the opaqued framework to the preparations on the working model with hemostats.



Figure 9: Photograph of the bridge restoration after divesting with sprues still in place.

Try-in Appointment

When the patient returned for the cementation appointment, the temporaries were removed with hemostats and a large spoon excavator. The preparations were cleaned using a combination of a scaler, explorer, sandblaster, and an antimicrobial scrub (Consepsis, Ultradent; South Jordan, UT) with a slurry of pumice and hydrogen peroxide. Hemostasis was achieved with ViscoStat (Ultradent).

All restorations were tried in with RelyX try-in paste shade BO5 (3M ESPE). Each bridge was tried in and held with sustained, progressive pressure until both were completely seated with pontics fully compressed into intimate contact with the tissue in the ridge areas with no blanching (Fig 10). Any areas of blanching were marked with pressure-indicating paste, and the pontic was meticulously adjusted and polished until there was only passive contact with the tissue.

After all units were in place, the patient was seated upright in the chair to assess all requested esthetic parameters. Once these were confirmed, the patient was given a mirror for the preliminary reveal and encouraged to walk around the office and view the restorations privately and under various lighting conditions, including outside. After she approved the restorations, they were removed, cleaned, and readied for bonding.

Cementation

The restorations were washed thoroughly, re-etched with 9.6 percent hydrofluoric acid, and silanated. They were coated internally with a thin film of Adper Single Bond Plus adhesive (3M ESPE) and loaded with RelyX veneer cement shade BO5, then set aside sequentially on an ambient light-protected tray. ViscoStat was reapplied within and around the sulcular areas, and each preparation was thoroughly cleaned with Consepsis, after which all preparations were washed with copious amounts of water.

The enamel was selectively etched with 38 percent phosphoric acid and washed thoroughly. All preparations were then completely isolated from moisture contamination and coated with G-Bond one-component, self-etching, light-cured adhesive (GC America; Alsip, IL) and thinned with an air syringe and an HVE suction tip (Medicom; Tonawanda, NY).

The veneers were gently seated in pairs onto the preparations; and while stabilizing the veneers with the end of a Benda Brush handle, they were tacked into place with an Optilux 501 curing light (Demetron/Kerr; Orange, CA). Each bridge was seated and held down by the doctor while the assistant tacked each abutment with the curing light tacking tip.

All remaining cement was then semi-cured using a wave technique with a slow, sweeping back-and-forth motion once on the lingual aspect of the bridges, and then back and forth once all across the labial surfaces. Gross cement removal was accomplished with a sickle scaler. Each labial and lingual surface was then light cured individually for 30 seconds, after which De-Ox glycerin (Ultradent) was applied to the marginal areas and light cured for an additional 10 seconds.



Figure 10: Intraoral lingual view of bridge during try in.



Figure 11: Postoperative retracted view of definitive restorations one week after placement.



Figure 12: Full-face postoperative image of the definitive restorations.

The restorations were then thoroughly washed and dried. Final cement removal was achieved using a Hu-Friedy (Chicago, IL) H6/H7 sickle scaler and Miltex (York, PA) #12 and #15 stainless steel disposable scalpels. Marginal flash was assessed using a sharp explorer and Butler unwaxed floss (Sunstar Americas; Chicago, IL). Using a Hu-Friedy Kincheloe gingival retraction instrument, the tissue was gently retracted while slight marginal irregularities and flash were removed with fine and ultra-fine diamonds (Brasseler USA; Savannah, GA).

Centric contacts and excursive movements were evaluated using AccuFilm (Parkell; Edgewood, NY). With copious amounts of water, Brasseler finishing diamonds were used to progressively refine the occlusion. Final polishing of adjusted areas was accomplished using Brasseler's Dialite Intra-Oral Porcelain Adjustment and Polishing Kit to create a wet, glazed look to the finished restorations (Figs 11 & 12).

Conclusion

Properly planned and well-executed esthetic restorative dentistry can profoundly influence our patients' lives in both tangible and intangible ways.¹² This case demonstrates first-hand how clichés such as “change your smile, change your life” are accurate. During the patient's initial visit, she had a shy and quiet demeanor due to her lackluster and displeasing smile. After completing her restorative treatment, she was radiant and overflowing with self-confidence (Figs 13 & 14). She stated that her new smile was having a positive impact on all aspects of her life, including relationships and her newfound modeling career. This case, although almost five years old, is still an unqualified success. Sarah's smile looks as healthy and as strikingly natural today as when it was originally completed.

Making a positive difference in a patient's life—as in the case presented here—is extremely rewarding. Commitment to excellence, adherence to proven principles, and meticulous attention to detail can not only yield outstanding esthetic results for our patients, but can also provide them with a sound investment in the healthy longevity of their entire dentition.

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Figure 13: Final view of the patient demonstrating her natural smile.



Figure 14: A very happy patient.

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