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Clinical Realities

RESTORATION OF THE MAXILLARY ARCH UTILIZING A COMPOSITE RESIN BUILDUP AND A FIBER FRAMEWORK

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TEAMWORK

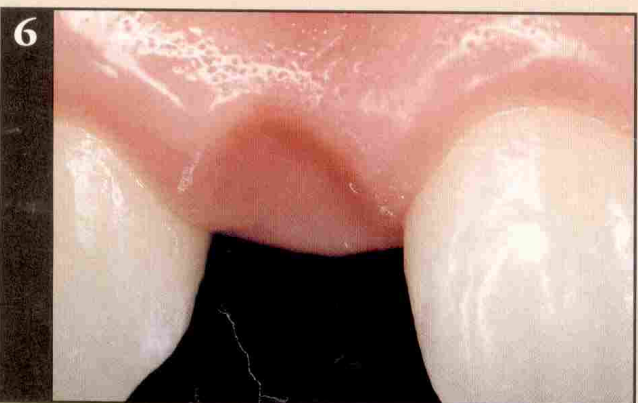
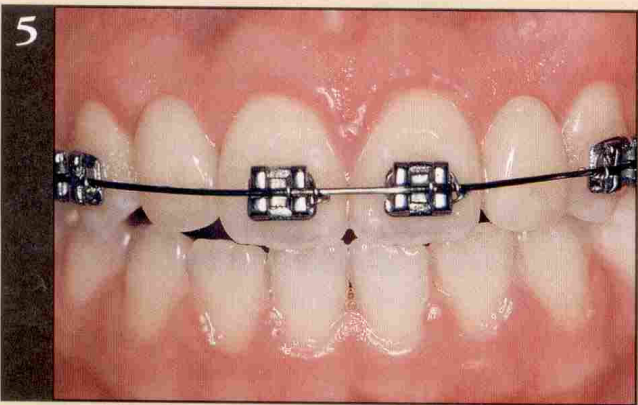
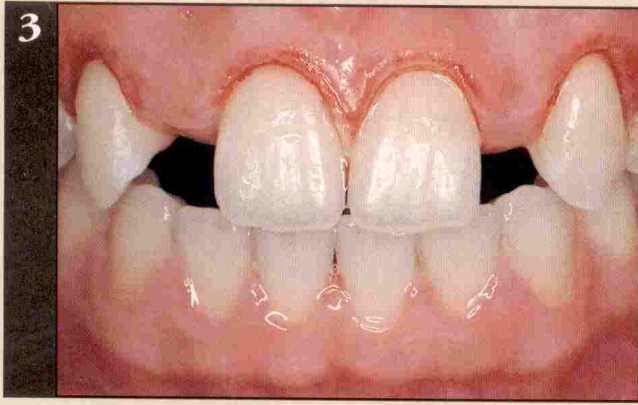
THIS SECTION OF THE JOURNAL FEATURES ARTICLES THAT EMPHASIZE THE VISUAL, PRACTICAL, AND CLINICAL ASPECTS OF DENTISTRY. IT PROVIDES A FORUM FOR PRESENTATION, IN PICTORIAL FORMAT, OF THE INTRICATE INTERACTIONS BETWEEN DENTIST AND TECHNICIAN, IMPLANTOLOGIST AND PROSTHODONTIST, ORAL SURGEON AND ORTHODONTIST, ETC. WHILE ARTICLES IN OTHER SECTIONS OF THE JOURNAL CONCENTRATE ON THE TECHNOLOGICAL AND SCIENTIFIC ASPECTS OF DENTAL PRACTICE, **CLINICAL REALITIES** ARTICLES EMPHASIZE PRACTICAL APPLICATIONS AND REVEAL THE RATIONALE OF THE TEAM APPROACH IN DENTISTRY. IT IS EXPECTED THAT THIS SPECIAL FORMAT WILL ALLOW READERS TO ASSIMILATE THE MATERIAL MORE READILY AND INCORPORATE IT IN THEIR OWN PRACTICES.

While edentulism can be treated through numerous treatment modalities, the selection of the proper approach is dictated by clinical factors that must be addressed prior to the initiation of therapy. Implant-supported restorations and removable prostheses often provide suitable treatment for numerous patients, although these modalities are characterized by extensive and invasive clinical protocols. One alternative to these procedures requires the use of contemporary composite resin materials to build up the edentulous site with an advanced layering technique.

Developments in composite resin technology have enabled the clinician to fabricate restorations using semidirect methods chairside. The physical properties (ie, color, viscosity, opacity, and polishability) of these materials allow the clinician to replicate intricate natural mamelons and translucency through advanced stratification techniques. While morphology is a primary concern in the achievement of a functional, aesthetic restoration, it is the proper handling of factors such as hue, value, and chroma that provides optimal results. The case presented in this *Clinical Realities* segment details the utilization of a multilayered composite resin buildup over an adhesively placed polyethylene framework to restore missing maxillary lateral incisors. While the fabrication and placement of the definitive restoration was completed by a single clinician, the treatment involved several interdisciplinary elements, including restorative dentistry, orthodontic care, and periodontal therapy.



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Presentation and Diagnostic Evaluation

A 24-year-old female patient presented with edentulous spaces caused by congenital agenesis of the lateral incisors. Previous orthodontic treatment had been completed, and the appliance had been removed. In order to maintain the correct position of the tissues and prevent a relapse from occurring, a removable prosthesis was worn (**Figure 1**). Several treatment modalities were presented to the patient, who required a minimally invasive yet aesthetic comprehensive restoration. Rehabilitation with bilateral single-implant prostheses was declined due to the invasive nature of the surgical procedure and treatment duration; adjunct vital bleaching was also declined. A proposal for buildup with multiple layers of composite resin and stabilization with a polyethylene ribbon was presented to the patient, who accepted this conservative modality as a result of the reduced treatment duration.

The gingival tissue of the patient was examined by the clinician in order to verify that an adequate quantity of keratinized tissue existed in the edentulous sites. Upon soft tissue evaluation, it was evident that the anterior segment of the patient required crown lengthening. In addition, the maxillary central incisors exhibited an unsatisfactory length to width ratio (**Figure 2**). In order to exhibit harmonious proportion to the adjacent dentition, the morphology of the teeth required correction. The gingival architecture had to be established so that the level of the canines was equal to that of the central incisors. Since the presence of canting would have compromised the aesthetic result, the clinician determined that electrosurgery had to be performed to correct the existing soft tissue silhouette.

Surgical Procedure

Once an anesthetic was administered, sounding of the bone crest was performed in order to determine if proper biological width was present. Measurements indicated that gingivoplasty would suffice to achieve the permanent corrective result (**Figure 3**).

Three weeks postoperatively, a degree of relapse had occurred at the site of the central incisors. A slight diastema was evident between teeth #8 and #9 (**Figure 4**). Using the original prosthesis, the anatomy of the pontic teeth was restored by apposition. In order to restore the cervical and incisal length of the teeth, a fine layer of microfilled composite resin (Renamel, Cosmedent, Chicago, IL) was applied to the mesial and facial aspects of the maxillary central incisors. The gingival architecture mimicked the natural tissue by the same procedure, maintaining the level of the gingival zenith of the lateral incisors short of the level of the maxillary central incisors, and positioned slightly off their long axis.

The patient returned to the orthodontist for the reestablishment of proper facial alignment in order to address the minor relapse that had occurred. The patient wore the appliance for a 7-day duration (**Figure 5**). Following the completion of the orthodontic procedure, gingival contouring was performed for a second time through electrosurgery to mimic the design established by the pontics. The architectural design of the prosthetic abutment of the appliance dictated the morphology of the tissue. Seated under compression, the pontic applied pressure to the soft tissues that developed the innate shape of the natural dentition. Proper anatomy and gingival contour of the ovate pontic restoration were reestablished.

The orthodontic appliance was removed by the clinician. Examination 4 weeks postoperatively revealed the proper pontic design and architecture of the sound gingival tissue (**Figures 6 and 7**). A chlorhexidine rinse was prescribed for the patient to prevent bacterial contamination of the site. The treatment site was subsequently prepared for the recording of impressions. This was completed immediately upon removal of the appliance in order to establish the position of the tissue. Any delay in this process could have resulted in tissue relapse. Once the orthodontic appliance and the transitional prosthesis had been removed, the proper gingival scalloping and symmetry of the interdental papillae were evident (**Figure 8**).

Fabrication Protocol

The framework for the definitive restoration was fabricated from a condensable composite material (Solitaire, Heraeus Kulzer, South Bend, IN) that is generally utilized in the posterior region. The physical properties of the material permitted the development of a durable restoration. A polyethylene ribbon (Ribbond, Seattle, WA) was used to provide reinforcement to the composite framework. Lingual preparation was accomplished according to the traditional preparation guidelines to achieve improved retention and stability of the prosthesis.

The connection sites on the models were fabricated to encompass the largest surface area possible on the palatal aspects. Proper gingival and incisal embrasure forms were established to allow subsequent buildup with composite materials. This permitted the utilization of various hygiene devices (ie, floss and interproximal brushes) to regulate the oral health of the patient.

The framework was subsequently tried in to verify the fit of the intended restoration (**Figures 9 and 10**). The clinician ensured that proper proximal contacts were maintained by the removable appliance in order to prevent

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any discrepancies upon final seating. Pontic design was verified by the clinician, to ensure the long-term stability of the treatment, and symmetry was established between the two maxillary anterior quadrants.

Several factors that related to the proportion of the restoration were then addressed. The incisal edge of the framework was fabricated 1.0 mm to 1.5 mm above the anticipated edge of the definitive restoration to allow sufficient space for the intrinsic composite buildup (**Figure 11**). This allowed the clinician to depict the mamelon morphology and polychromatic variations imparted by the use of multiple composite resins, tints, and opaquers.

Composite Resin Layering

During chairside fabrication, the pontic was cut approximately 0.5 mm short of the free gingival margin in order to facilitate the development of a composite restoration that appeared to emerge from the gingival tissue (**Figure 12**). While a composite resin must be selected to match the shade value, hue, and chroma of the adjacent central teeth, the clinician selected a composite resin that was 1 chroma higher than that of the adjacent tooth for this presentation. This imparted a transitional appearance on the maxillary arch, which was altered slightly from the central incisors, the built-up lateral incisors, and the canines.

The mamelon buildup was completed utilizing a hybrid composite resin (Renamel Hybrid, Cosmedent, Chicago, IL). The translucency and opalescence of the teeth were rendered with a microhybrid composite resin (Vitaescence, Ultradent, South Jordan, UT). In order to replicate the maverick colors and to provide additional polychromatic effects, a series of buildups was completed using tints (Creative Color, Cosmedent, Chicago, IL) and opaquers (KolorPlus, Kerr, Orange, CA) (**Figure 13**).

The pontics were heat-tempered under approximately 85 psi at 120° C for a 10-minute period. The heat-tempering process enhanced the physical properties of the framework and the composite buildup. A definitive finish and polish was performed to achieve a luster that would be indistinguishable from the natural dentition (**Figure 14**).

Cementation

In order to facilitate cementation, the pontic wings and the palatal aspects of the maxillary canines and central incisors were sandblasted with 50 μ m aluminum oxide (Micro-etcher II, Danville Engineering, San Ramon, CA). Phosphoric acid (35% Ultra-Etch, Ultradent, South Jordan, UT) was applied to cleanse the pontic wings, which were

subsequently rinsed and dried. Since the condensable composite resin was a hybrid material, silane was also applied to the wings. The central incisors were also prepared with phosphoric acid. A single component adhesive (Single Bond, 3M, St. Paul, MN) was applied to the pontic wings and the abutment teeth, and the pontics were bonded into place with a light-cured cement (Ensure, Cosmedent, Chicago, IL) (**Figures 15 and 16**).

The pontics were initially spot-cured with a 4-mm turbo light guide (Optilux 500, Demetron/Kerr, Orange, CA) to allow for the partial removal of excess cement between and beneath the pontic and around the abutment teeth. Glycerine was applied over the entire restoration. The wings and the facial aspects of the pontics were exposed to a 13-mm light guide for an additional 60 seconds.

The fidelity of the material, color, and texture of the pontic restorations and the composite buildup were observed upon completion of the technique (**Figure 17**). The correct morphology and condition of the interdental papillae was also evident (**Figure 18**). The duration of the entire treatment from the initiation of the electrosurgery to the completed restoration was only 2 months, which was significantly shorter than more invasive alternative restorative procedures (ie, implant therapy or a conventional 3-unit bridge).

Conclusion

Restoration of a harmonious anterior segment is feasible utilizing a variety of treatment modalities. The material properties (ie, polishability, opacity, color) of contemporary composite resins permit the achievement of aesthetic results that were formerly accomplished only with porcelain and implant-supported restorations. Distinct mamelons, translucency, maverick colors, and innate dentin characteristics can be replicated with the use of the aforementioned composite resin layering protocol. By employing these techniques, greater control over the anatomy and color of the definitive restoration is attained, provided the clinician has adequate training and is proficient in the application and stratification of advanced composite resin materials. This conservative modality can be completed by a single clinician in a reduced treatment period, as opposed to conventional techniques. The procedure adheres to principles of occlusion and periodontal hygiene while facilitating a long-term functional, aesthetic result.

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