An Alternative Approach to Cosmetic Space Closure

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INTRODUCTION

Nowadays, a great premium is placed on aesthetics with cosmetic solutions being sought by the parents of adolescent patients at very early ages. Conventional orthodontics plays a huge part in satisfying this demand in adolescents, but cannot always provide all the answers.

In cases such as partial anodontia, peg lateral incisors, misshapen and malformed teeth, additional aesthetic improvements have to be provided by a variety of restorative procedures. Whenever possible in adolescents, these techniques should be minimally, if at all, invasive. Gingival tissues continue to mature and change shape during this period, as do skeletal changes through skull growth, and therefore, as a general rule, any restorations placed should be viewed as providing a solution in the medium term until early adulthood. Restorations placed subgingivally for aesthetics at an early age are soon likely to appear supragingivally and require probable replacement especially in the high lip line case. Consequently, simple direct composite placement techniques have evolved to provide this medium-term aesthetic solution.

Limitations of Direct Placement Composites

Direct placement of composites as a filling and cosmetic bonding material has been available for many years and it is not within the scope of this article to review the chemistry and clinical techniques associated with these materials.

As a general rule, indirect bonding, when used to close diastemas, can provide an excellent and predictable aesthetic result. The case in Figure 1 shows how more advanced and extensive space closure cases can prove too complex when using the direct technique—poor slanted midline closure, disproportionately shaped teeth, and a particularly disappointing emergence profile. Although various techniques have been advocated, including the use of various space closure celluloid formers to overcome these problems, the final results in the authors' hands can still be unpredictable. It is the opinion of the authors that these complex cases are more easily, cheaply, and predictably restored with

Figure 1. An example of poor aesthetics with direct composite bonding.

Figure 2. A pretreatment aesthetic dilemma presented by the excessively large diastemas.

Figure 3. The case following Invisalign orthodontic tooth movement. (*Courtesy of Dr. R. Edwards.*)

Figure 4. The case upon completion of indirect composite.

indirectly custom-fabricated composite mesial/distal space closure veneers (or *chips*, as they are sometimes called) (Figures 2 to 4).

Although this technique can also be carried out using porcelain chips, the degree of tooth preparation required to achieve an imperceptible join between the tooth and porcelain, along with associated problems of color matching and cost preclude their use in the medium-term in teenagers and are ideally provided in the early adolescent age group upward.

CASE REPORT

Diagnosis and Treatment Planning

The 16-year-old patient seen in Figures 5a to 5c presented for a cosmetic opinion toward the completion of his orthodontic treatment. In the lower arch, both central incisors were congenitally absent, and orthodontic tooth movement had provided a one-toothed space for restoration. His age precluded implant placement and the interim proposed solution of the provision of a conventional Maryland bridge was accepted by the patient and his mother.

The aesthetic problems in the maxillary arch were more complex. Both lateral incisors were malformed as well as misshapen. All 4 incisors were wider at the necks than at the incisal edge, with both canines relatively pointed. As tooth positioning following orthodontics was excellent for aesthetics and lip support, further treatment to bring the teeth together would have been counterproductive. Finally the patient and his mother were adamant that whichever technique was chosen to improve aesthetics, it was to be minimally if at all invasive.

The patient additionally requested that tooth whitening be carried out prior to the restorative phase of treatment, and his existing Raintree Essix Orthodontic Retainers (DENTSPLY International) were used as trays for "at-home" whitening using 15% Carbamide Peroxide Gel (Ultradent Products).

Study casts were taken and mounted with a face-bow on a semi-adjustable articulator (Dentatus). The case was studied with particular respect to the proposed space closure and the maintenance of the correct crown width to length ratio of 75% and corresponding Golden Proportion ratios for remaining teeth. Although minimum/no preparation veneers (eg, Lumineers) were an option if crown length was to be increased, this approach was not the preferred choice of the patient.

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Figures 5a to 5c. Preoperative photos.

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Tooth size was analyzed by my technician with Digital Callipers (Harbor Freight Tools) and a diagnostic wax-up carried out with IQ Compact Opaque Wax (Yeti Dental) without increasing tooth length (Figures 6 and 7), while ensuring that the theoretical demands of the Golden Proportion were met. The following treatment plan was proposed: 2 composite veneers to address the issue of tooth width and the malformed buccal surfaces of the lateral incisors, as well as the provision of indirect interproximal composite veneers on the central incisors to close the remaining diastemas and mesially on both canines to improve their aesthetic appearance. The existing large overjet following orthodontic treatment would ensure that occlusal stresses on the composite restorations were minimal and chipping unlikely in everyday usage.

The patient was informed that minimal preparation of the lateral incisors would be necessary to improve their surface morphology and provide finishing lines. In addition, the provision of minimal depth grooves within enamel on the central incisor and canine teeth would be required to provide location and seamless transition between the composite chips and enamel on the buccal surfaces of the teeth. Similar cases were demonstrated to the patient and the treatment plan accepted.

Clinical Technique

Following tooth whitening, color swatches similar in shape to the final restorations were made in a variety of composite combinations on the upper study model to trial fit on one of the central incisors. These swatches were located in turn and, without enamel etching, bonded sequentially in place with the chosen translucent composite luting cement (Choice 2 Cement [BISCO Dental Products]) to be used in final bonding, until such time as the correct color match had been achieved. The color combination was noted for future use during fabrication of the final restorations.

Figure 6. The original study model.

Figure 7. The diagnostic wax-up completed by the dental laboratory team.


Figures 8a and 8b. Minimal tooth preparation.

Figure 9. The final working model.

Figure 10. The indirect composite mesial space closure veneers was done for both central incisors.

Figure 11. A close-up view of the indirect composite space closure veneers on the working model.

Figure 12. The first space closure veneer following bonding.

Figure 13. Bonded indirect veneers following initial trimming.

Figure 14. Bonding of the full veneer on the lateral incisor.

While refining this technique in previous cases, it became apparent that the issue of the emergence profile and the creation of papillae could only be addressed by extending the veneer chips subgingivally to a featheredge margin necessitating use of retraction cord prior to tooth preparation. The design of the chips also required positive location to ensure correct placement and positioning on the teeth during bonding. To satisfy this requirement, the shape of each chip was extended over the incisal edge to provide a location *handle* and cut away once bonding was completed.

Following placement of gingival retraction cord (Racestyptine Cord [Septodont]), the necessary minimal tooth reduction was carried out conventionally for the full veneers, and vertically on the buccal surfaces of the other teeth and extending along the gingival margin just into the palatal surface in order to provide a positive finishing line (Figures 8a and 8b). The final impression was taken with Polyether Rubber (Impregum 6 Minute Hard [3M ESPE]) in a custom tray. Temporary restorations were not required in this case. Then, the final impression was poured in stone (Fuji Rock [GC America]) to fabricate the working model (Figure 9).

For the laboratory stage of fabrication, an indirect composite system was chosen (Gradia [GC America]). A separator (Gradia Separator [GC America]) was applied to the working model and the chips fabricated to the previously chosen shade combination: A1 dentine combined with a superficial layer of enamel E2 and Intensive Enamel EI1. Translucent enamel was used only on the locating handle.

To ensure that the aesthetic appearance achieved with the trial wax-up was duplicated, the dental technician started by creating the ideal shape and width of the full veneers on both lateral incisors, followed by the space closure veneers (Figure 10) on the mesial surfaces of the canines and, finally, on the distal then mesial surfaces of the central incisors (Figure 11).

The authors' preferred composite bonding system in cases such as these comprises of Uni-etch, One step Plus, Composite Activator, and Choice 2 Cement (Translucent) (BISCO Dental Products). Translucent cement was used to ensure that the transition between the enamel and composite chip would be imperceptible, commonly known as the contact lens effect. The use of a shaded cement can often result in the transition line being visible.

Figure 15. Final bonding of space closure veneers on the canine and central incisor.

Figure 16. The case on presentation and following orthodontic band removal.

Figure 17. The case upon completion, final polishing, and provision of a Maryland bridge to replace the missing lower incisor.

Figure 18. The case preplacement—lateral view.

Figure 19. The completed case—lateral view.

Final Placement

Isolation was achieved with the placement of rubber dam, but the clinical photographs shown are following sequential cementation and removal of the rubber dam to give a clearer picture of the results achieved with each clinical step.

Prior to etching, the teeth involved were thoroughly cleaned by spraying 50 µm oxide powder using the EtchMaster (Groman Dental) and all the powder thoroughly washed off.

Figure 20. Preoperative smile.

Figure 21. Postoperative aesthetics.

Prior to bonding each full veneer and individual chip, the tooth was isolated from adjacent teeth with a celluloid matrix strip. Each surface was treated sequentially with the manufacturer's recommended technique which is common for all composite bonding systems; namely etching the enamel, thorough washing of the etchant gel, drying, then application of the bonding agent and subsequent light-curing. The fit surface of each chip was treated with composite activator prior to the application of One Step Plus but not light-cured. A thin layer of cement was applied to the fit surface and the veneer gently eased into place and excess luting cement removed with a sable brush prior to light-curing. In the case of each chip, the handle was removed first and, along with the cemented veneers, polished with composite finishing discs and rubber cups (Shofu Dental) prior to fitting the next one in the cementing sequence. Each subsequent chip was trial fitted to ensure correct location and passive fit prior to further bonding. The cementation sequence is shown in Figures 12 to 15.

The case pre- and postbonding is shown in Figures 16 and 17, and after fitting the lower Maryland bridge in Figures 18 and 19. The final clinical results achieved are shown in Figures 20 and 21.

CONCLUSION

The suggested technique as outlined is very predictable and it demonstrates both excellent aesthetics and color matching. Natural-looking gingival papillae, resulting from proper emergence profile, were created by the fabricated shape of the veneers and chips. The technique has the added benefit of being simple and cost-effective as skilled dental technicians versed in the art of indirect composites can easily carry it out. Composites have shown excellent and predictable longevity, especially when bonded to enamel. If necessary, following the arrival of full dental maturity, the composite can easily be stripped off and replaced (utilizing the same technique described herein) using an appropriate pressed ceramic material.

The clinical technique presented in this article offers clinicians a simple and effective method of fulfilling a patient's requirement for a cost-effective, predictable, noninvasive solution to a complex aesthetic challenge in adolescents.✦

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