CORRECTION OF CONGENITALLY MISSING LATERAL INCISORS WITH PORCELAIN VENEERS

Jack D. Griffin, Jr., DMD*

The ability of the dental professional to improve a patient's smile has become a benchmark in modern aesthetic dentistry. When one type of tooth is transformed into another through the restorative process, special care must be taken to ensure correct preparation and gingival contours to create the illusion that the teeth are in their correct position. With accurate digital photographic planning, active patient consultation, detailed tooth preparation, and a meticulous laboratory sequence, porcelain laminate veneers can be functional and can achieve the aesthetic expectations of the patient.

Learning Objectives:

This article discusses the options for correcting congenitally missing lateral incisors and the aesthetic complications when managing repositioned canines. Upon reading this article, the reader should:

- Understand the aesthetic requisites that must be satisfied when transforming canines into lateral incisors and premolars into canines.
- Recognize the need for communication with the orthodontist to coordinate tooth movement with aesthetic solutions and treatment options.

Key Words: veneers, mockup, porcelain, congenitally missing incisors

**Private practice, Eureka, MO.*

Jack D. Griffin, Jr., DMD, 18 Hilltop Village Center Drive, Eureka, MO 63025
Tel: 636-938-4141 • E-mail: Esmilecenter@aol.com

For over 20 years, bonded porcelain restorations have been used successfully to enhance the aesthetic appearance of teeth compromised by form, color, or position.[1] Porcelain veneers, which have been accepted for long-term augmentation of tooth and smile deficiencies with congenitally missing teeth, allow clinicians to create this aesthetic ruse.[2,3] There are many challenges to consider when canines are used to replace congenitally missing lateral incisors. From an aesthetic standpoint, not only must the canines mimic the lateral incisors, but the first premolars must be made to appear as canines. In such cases, the anatomical and functional challenges must be incorporated into a thorough treatment plan, soft tissues must be enhanced, and the preparation design must be visualized to provide the needed contours.[4,5]

Orthodontic Considerations

With congenitally missing incisors, the orthodontic practitioner must weigh many factors when deciding if the canines should be placed laterally or if gaps should be opened and treatment planned for fixed partial dentures (FPDs) or dental implants.[6] When the canine is brought mesially into the position of the lateral incisor, all posterior teeth must also be mesialized to close the resulting spaces. Selection of the ideal treatment option depends upon many factors, including occlusion and patient desires.[7]

Since the canines are normally darker, broader buccally, and have soft tissue shape often inconsistent with lateral incisors, spaces are commonly created to allow FPD or implant placement.[8] This allows the first premolars to stay in their posterior position, where the more occlusal tissue heights and lingual cusps can function and appear more natural.

In the author's experience, teeth being moved mesially often compromise buccal corridor development leading to shadow because of a loss of total tooth volume. The reduction in tooth volume and arch length can cause a narrowing effect that leads to shadowing inside the cheek from a frontal smile perspective. As a result of these and other factors, the orthodontist and restorative dentist should be in agreement with final treatment goals and tooth positioning prior to finalizing orthodontic treatment. This article discusses a technique using porcelain veneers to provide corrective treatment to patients with congenitally missing lateral incisors.

Case Presentation

A 20-year-old female patient presented after having undergone orthodontic treatment to improve her smile (Figure 1). Orthodontic therapy was completed without

Figure 1. The preoperative smile was unnaturally dark due to the mesially repositioned.

Figure 2. Since the canines were wider than the lateral incisors they would replace, a compensating reduction in width was required.

Figure 3. The tissues of the first premolar required gingivoplasty to move tissues apically and to widen the emergence from the gingiva.

Figure 4. Preoperative lingual view of the patient's maxillary arch.

Figure 5. The calipers were then held over the canine in the lateral position to verify a correct lateral to central ratio.

Figure 6. The mockup was evaluated and any required adjustments were made.

Figure 7. Preparations were first completed as a 0.5-mm to 1-mm porcelain veneer reduction and margins were placed at the gingival levels.

Figure 8. The soft tissue margins were moved apically and shaped on the mesial side to widen the emergence profile of the first premolar.

consulting a restorative clinician, and all posterior teeth were brought mesial to compensate for the congenitally missing lateral incisors. This resulted in a darker, unnatural looking result.

The treatment plan included a frenectomy to decrease the likelihood of recession around the central incisors, gingivoplasty around the first premolars, and gingival crown lengthening around the premolars (Figures 2 through 4).[9] Diode lasers can be used predictably for these tissue enhancements when care is shown in the proper use of settings, when measuring pocket depths, and when there is an understanding of biologic width.[10,11]

Since natural canine gingival heights are more apical and broader than those of the premolars, tissue reshaping was planned to increase the emergence profile to a level more often seen in canines. Canines have a buccal prominence not evident in lateral incisors; care would thus be taken to provide the laboratory technician with adequate space to cover the tooth and maintain new incisor contours.

Treatment Mockup

A mockup was critical for fabrication of the provisional restorations, enabling the patient and clinician to evaluate aesthetics and phonetics, and to preview the anticipated result.[12] Before anesthesia was delivered, retractors were placed and the canines and premolars were etched. A microhybrid composite (eg, Esthet-X, Dentsply Caulk, Milford, DE; Filtek Supreme, 3M Espe, St. Paul, MN) that approximated the final shade was placed on the canines and premolars. The width of the lateral incisors was determined by measuring the central incisors with calipers. After composite resin was added, the calipers were held over the canines so that the width approximated 75% of the central width (Figure 5).

After composite resin had been applied to the facial surfaces of the premolars, the contours and phonetics were evaluated (Figure 6). Tooth proportion was critical for a pleasing outcome and, following the principles of the "Golden Proportion," central dominance and a height-to-width ratio of about 75%, served as a basis for the mockup.[13] From this, an alginate impression was made, poured up, and a vacuum-formed matrix made for subsequent fabrication of the provisional restorations. This mockup was also forwarded to the laboratory.

Intraoral Preparations

There are many choices for aesthetic materials, each with its own preparation protocol.[14] With these systems it is critical to understand the reduction needed, optimal margin placement, and preparation shape for proper

restoration aesthetics and long-term function.[15,16] A coarse reduction depth diamond and a tapered diamond were used to provide sufficient reduction for the desired feldspathic porcelain.[17] A standard 0.5-mm to 1-mm reduction was performed on all teeth with rounded chamfer margins, as is performed for a standard porcelain veneer case without regard to tooth proportion (Figure 7).

Since excessive frenal tissue between the incisors can "pull" on the gingiva and the potential for recession existed,[9] a frenectomy was performed with a diode laser (ie, Odyssey, Ivoclar Vivadent, Amherst, NY) (Figure 9). The laser was set on a low power setting of 2.0 watts and the frenum was removed with "brushing" strokes to remove all loose tissue (Figure 8).

Gingival enhancements were then performed on the premolars. The pocket depths were measured at 2 mm to 3.5 mm and recontoured, preserving biologic width.[18] To mimic a canine, tissue was removed on the mesial side to widen the emergence profile (Figure 9). This reduction was blended onto the facial aspect, where 1 mm to 2 mm of tissue height was removed to make the premolars appear as long as the teeth being replaced. This reshaping was accomplished as the clinician preserved a gradual decrease in clinical crown length from mesial to distal.

Impressions and Provisionalization

The canine margins were then refined and moved approximately 1 mm subgingivally, as needed, in areas of soft tissue sculpting. A smooth transition of the gingival heights from the central incisors back to the second premolars and margins placed just apical to those points was ensured. The conversion of the canines into lateral incisors included flattening the faciogingival aspects and distal reduction to a knife-edge margin to reduce the tooth width as planned (Figure 10).

Conversion of the premolars to canines involved carrying the mesial margin toward the lingual side to provide sufficient space for the increased width of the restorations. Although the lingual aspect of the canine was wider than a lateral incisor would be, the illusion of its harmony in the arch was created by narrowing of the distal facial line angle. This angle was also moved mesially and prepared with a tapering feather-edge margin lingually. This provided the ceramist space to make porcelain of sufficient thickness without reducing the entire tooth for a full-coverage crown.

Braided cord was used for retraction along with a gingival retraction paste (ie, Expa-Syl, Kerr/Sybron, Orange, CA). The cord provided gingival deflection in areas that measured more than 1 mm subgingival. The gingival retraction paste effectively controlled

Figure 9. Gingival heights were examined to verify a smooth transition from central incisor to molar.

Figure 10. The facial aspects of the canines were flattened, and the distal side was reduced to a width 1 mm less than the desired width of the intended lateral incisors.

Figure 11. Retraction paste was placed primarily in areas of bleeding; braided retraction cord was placed to increase tissue displacement.

Figure 12. Self-cured provisional restorations were made using a 0.020" vacuum-formed matrix.

Figure 13. Tissue adaptation was positive at two weeks, with minor irritation on the distal side of the restored lateral.

Figure 14. The small amount of cement left between the lateral and the canine was cleaned up using scaler and composite knife.

Figure 15. The smile was more proportional, while the color differences in the original canines have been masked without the appearance of thick, bulky, or opaque teeth.

Figure 16. Lateral view demonstrated the improved proportions of the lateral incisors, canines and first premolar teeth.

bleeding and rinsed cleanly from the preparation, thereby reducing the potential of "black margins" later from hemostatic contaminants (Figure 11). Two full-arch vinyl polysiloxane impressions were made, a lower model was made from the alginate, and a bite registration was taken.

Immediate dentin sealing with dentin adhesives has been noted to increase dentin bond strengths, reduce bacterial microleakage, and cause less dentin sensitivity in comparison to provisional restorations placed on unbonded teeth.[19] The teeth never leave the author's practice in an unsealed state, which may reduce the potential of bacterial invasion from microleakage and may lead to postoperative sensitivity.[20]

The teeth were etched and subsequently coated with two coats of a dual-cure bonding agent (eg, Cabrio, Discus Dental, Culver City, CA; Optibond Solo Plus, Kerr/Sybron, Orange, CA). This was followed by a glycerin separating medium to keep the temporary material from bonding to the teeth. The provisional restorations were then fabricated from a composite material (eg, PerfecTemp II, Discus Dental, Culver City, CA; Luxatemp, DMG/Zenith, Englewood, NJ) inside a 0.020" suck down splint (Figure 12). The contours were then refined and polished. An adjustment was made at a one-week follow-up visit. An alginate impression of the corrected provisional restorations was made and forwarded to the dental laboratory, where eight feldspathic porcelain veneers with incisal characterization were fabricated. A moderate amount of translucency to create a natural appearance was necessary to meet the patient's expectations. The liquid-powder-stacked porcelain veneers would yield excellent vitality while providing sufficient strength for the anterior region.[21]

Insertion and Evaluation

The provisional restorations were removed, and the teeth were cleaned with a hand scaler and pumice, and were rinsed thoroughly. After securing patient approval, the teeth were etched according to the total-etch technique and recoated with a bonding agent to ensure coverage of all enamel and dentin surfaces. The veneers were luted in place with a light-cured resin cement, starting from the midline and working distally. The restorations for the incisors were placed, cured, and cleaned. The posterior teeth were treated similarly, and verification of proper occlusion followed.

Two weeks postoperatively, tissue response was very good with slight redness in the areas where recontouring was performed. The areas around the new "canines" responded well, and a natural emergence profile was created (Figures 13 and 14). Despite the loss of tooth

Figure 17. Emergence profile of the canines and first premolars achieved the patient's expectations.

Figure 18. Postoperative lingual view demonstrated a more natural morphology and width.

volume, mesial movement of teeth, and the narrowing of the arch that accompanies it, there was sufficient development of the buccal corridor (Figure 15). Tooth proportions were achieved to create a proportional smile while preserving gingival health.

Eight weeks after preparation and gingival enhancements, the healing was complete and physiologically acceptable (Figures 16 and 17). Had the teeth remained in their normal position and FPDs or implants placed in the position of the missing lateral incisors, the aesthetics might have been even further enhanced. This would have allowed for broader arch development in length and width in the canine eminence area. At the conclusion of treatment, however, contours and function were clinically acceptable and a more ideal shape and width to the incisors was achieved with a relatively minor amount of tooth reductions and gingival refinement (Figure 18).

Conclusion

Porcelain laminate veneers can meet the aesthetic and functional desires of a patient with congenitally missing lateral incisors. Veneers are a great choice for transforming canines into lateral incisors and cuspids from first bicuspids while providing long term clinical success with relatively minor tooth preparation. Diligent visualization, preparation, and communication with the patient and laboratory technician enabled the author to meet the patient's expectations. It is important for the clinician and patient to preview the teeth with direct composite, and then prepare to give the technician a chance to properly contour the case.

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Continuing Education (CE) Exercise No. 16

To submit your CE Exercise answers, please use the answer sheet found within the CE Editorial Section of this issue and complete as follows: 1) Identify the article; 2) Place an X in the appropriate box for each question of each exercise; 3) Clip answer sheet from the page and mail it to the CE Department at Montage Media Corporation. For further instructions, please refer to the CE Editorial Section.

The 10 multiple-choice questions for this Continuing Education (CE) exercise are based on the article "Correction of congenitally missing lateral incisors with porcelain veneers," by Jack D. Griffin, Jr., DMD. This article is on Pages 475-480.

1. Treatment planning involving orthodontics and restorative dentistry is best planned by whom?
a. Periodontist.
b. Orthodontist.
c. Restorative dentist.
d. Plan devised by restorative dentist and orthodontist.

2. Which of the following is NOT a problem often associated with bringing canines and premolars mesial to close a lateral incisor space?
a. Buccal corridor deficiencies.
b. Increased sensitivity to cold.
c. Proper proportion in final tooth contours.
d. Development of aesthetic gingival morphology.

3. Restorative choices for congenitally missing lateral incisors include which of the following?
a. Implant and fixed crown.
b. All porcelain fixed partial dentures.
c. Veneers on teeth moved orthodontically to close spaces.
d. All of the above.

4. Which of the following is NOT a factor influencing a satisfactory outcome?
a. Type of composite used in mockup.
b. Overcontoured buccal aspect of canines.
c. Emergence profile of first premolar tissues.
d. Darkness often found in canines that will become lateral incisors.

5. Which of the following is true of the mockup?
a. It is not important.
b. It should be done after anesthesia.
c. It is made of composite and done after tooth preparation to verify adequate reduction.
d. It is only an approximation of final tooth shape and contour.

6. Why is the mockup an important tool?
a. It aids in fabrication of the temporaries.
b. It helps in planning tooth reduction.
c. It allows the patient to see a preview of the anticipated results.
d. All of the above.

7. Which principle must NOT be violated when recontouring the gingival?
a. Antes law.
b. The golden proportion.
c. Biologic width.
d. Reduction of excessive frenum.

8. Which side of the tooth is reduced when the width of the canines is excessive compared to the lateral being replaced?
a. Distal.
b. Mesial.
c. Lingual.
d. Occlusal.

9. Why is it important to send a full series of digital images to the laboratory?
a. To be used in the laboratory portfolio.
b. They are used for final shade matching.
c. To serve as tooth proportion measurement guides.
d. To communicate the goals of treatment.

10. Which is not a key to success in the case presented in this article?
a. Visualization of the outcome.
b. Preparation to allow ceramist room to make correct teeth.
c. Communication with the patient to ensure expectations are met.
d. Convincing patient of a treatment plan.