

# Porcelain Veneer Restoration of Canine Lateralization in Congenitally Missing Lateral Incisors: An Aesthetic Challenge

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The prevalence of congenitally missing teeth in the general population has been estimated by many authors<sup>1,2</sup> to be between 6 and 10 percent. The incidence of missing maxillary lateral incisors is between 1–2%.<sup>3,4</sup> Absence of both maxillary lateral incisors occurs more often than the absence of a single lateral<sup>5</sup> and when unilateral, the contralateral maxillary lateral incisor is found to be a microdont in 57% of patients. This suggests that microdontia represents a variable expression of the same developmental defect that results in absence.<sup>3</sup> Missing laterals are the third most common missing teeth after upper and lower second premolars.<sup>6</sup> Many post orthodontic tooth size-arch size discrepancy cases, combined with missing teeth, present a major aesthetic restorative challenge.

The two major alternatives in treatment planning for missing

lateral incisors, orthodontic space closure or space opening for prosthetic replacements, can both compromise aesthetics, periodontal health and function.<sup>6</sup> The ideal treatment is the most conservative option that satisfies

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individual esthetic and functional requirements.<sup>7</sup> Selecting the most appropriate treatment plan depends on the malocclusion, the tooth-size relationship and the

size and aesthetics of the canine.<sup>8</sup>

Other factors to consider include: the skeletal base relationship, severity of crowding, overjet, overbite, position into which the canine erupts, crown sizes, crown shapes, gingival contours, gingival display on smiling, space and bone required for implant fixtures, and financial and biological costs.<sup>9</sup> It is absolutely critical for the orthodontist and restorative dentist to work together through diagnosis, orthodontic treatment and post orthodontic restoration.

## **SPACE OPENING**

Treatment alternatives for restoring open edentulous spaces resulting from congenitally missing laterals include removable partial dentures, conventional fixed bridges, resin-bonded bridges, auto transplantation, and single-tooth implants.<sup>10</sup> To optimize function and aesthetics, space should be opened using fixed appliances to accommodate an appropriate

prosthesis.<sup>11</sup> When orthodontic space opening is indicated, orthodontic treatment will maintain or establish a normal buccal occlusion, redistribute the available space, close the midline diastema, and retract and upright maxillary canines.<sup>12</sup>

At a time when aesthetic dentistry has gained prominence, prosthodontic solutions such as implants have become optimal esthetic treatment options.<sup>13-15</sup> Studies clearly demonstrate that the longevity of implants far supersedes that of the 3-unit fixed partial denture.<sup>16</sup> However, in opening the space, there are many clinical considerations to take into account. A critical factor is the amount of alveolar ridge that is available to place an implant, as the missing lateral will create an indented bone level that will often require augmentation before implant placement. One method to create bone in the area, is to let the cuspid erupt mesially, creating its buccal eminence, and then to move the tooth distally so

that bone is deposited, forming an ideal alveolar ridge with adequate bucco-lingual width for proper implant placement.<sup>17</sup>

Equally important is the ability to realign the roots of the teeth bordering the space and creating enough space to be able to place an implant without compromising the periodontal health of the adjacent teeth.<sup>18</sup> Can the space be opened to create the required esthetics of mesial distal width between the central incisor and the lateral that should follow the golden proportion: one lateral incisor is equal to two-thirds of a central incisor?<sup>19</sup> The major disadvantage of orthodontic space opening is that it commits the patient to a permanent prosthesis in an area of the mouth in which tooth shade, gingival contour and margins are critical and not easy to control.<sup>12,20</sup> As well, it is difficult during the orthodontic treatment phase to create the gingival architecture that is required, and to place an interim prosthesis that is esthetic for the patient.<sup>21</sup>

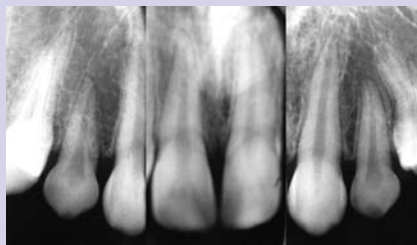
**SPACE CLOSURE**

Moving the canine into the position of the maxillary lateral incisor creates many challenges in occlusion and aesthetics. Moving the canine mesially will usually result in premolar rise. Premolars due to their anatomy are poor substitutes for canines, and will often demonstrate abfraction lesions due to flex, which may then create a long term occlusal, functional, esthetic, periodontal and sensitivity problems for the patient.<sup>22</sup> The lingual convexity of the canine, which interferes with the labial incisal surface of the lower lateral incisor, will inevitably result in a labial displacement of the tooth post orthodontically. This positioning can be minimized by careful recontouring of the lingual surface during orthodontic treatment to lingualize its position.

The canines on average are 1.2mm wider than the lateral incisor.<sup>23</sup> They are also at least 1/2 to 1 shade darker than the central incisors and these teeth darken significantly when the



**FIGURE 1**—Preoperative view of patient at presentation to office.



**FIGURE 2**—Radiographs of upper anterior quadrant.



**FIGURE 3**—Study casts trimmed to estimate final position of gingivectomy.



**FIGURE 4**—Diagnostic laboratory workup.



**FIGURE 5**—Clear surgical template showing porcelain length which will be added to teeth.



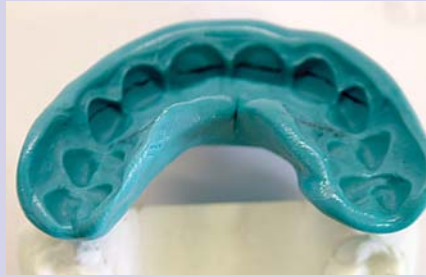
**FIGURE 6**—Inverse bevel gingivectomy after marking sulcus depth.



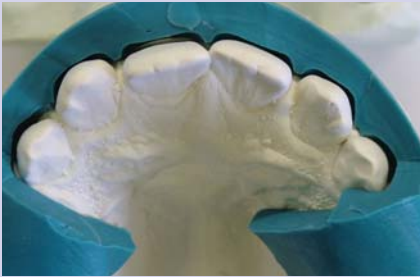
**FIGURE 7**—Surgical template intra-orally to verify tissue height reduction.



**FIGURE 8**—Clear silicone matrix over wax-up.



**FIGURE 9**—Putty reduction guide showing pick up of pencil cut lines.



**FIGURE 10**—Putty reduction guide on diagnostic cast showing required tooth reduction.



**FIGURE 11**—Post operative gingivectomy healing.



**FIGURE 12**—Esthetic mock-up of final shape and size for patient evaluation and consent.

labial enamel is recontoured or reduced.<sup>24</sup> The incisal embrasures are too open creating a vampire type look. The labial tissue and bone eminence associated with the cuspid does not look natural next to the central incisor, and depending on the type of orthodontic tooth movement required to position the cuspid, passive tissue eruption can result in a clinically short crown with unaesthetic tissue heights. The presence of spaces to be closed, in addition to clinically short crowns, often creates a situation where an aesthetic compromise is the only option.

As can be seen by the above discussion, either treatment alternative presents its own unique clinical and aesthetic challenges. The following is a case presentation of a patient who presented to the restorative office post orthodontically, without any prior communication from the orthodontist. The permanent laterals were missing with canine lateraliza-

tion, and the post orthodontic result is unusual in that the primary cuspids are retained with fully formed roots distal to the permanent cuspids. It presents many of the challenges discussed above in tooth spacing, size, shape, colour and position, along with tissue height discrepancy.

Figure 1 shows the preoperative photo of the patient when referred from the orthodontist. The centrals have been moved together with the cuspids in the position of the lateral incisors. Passive eruption has resulted in the appearance of short wide teeth with spacing distal to the central incisors and cuspids. Widening of the teeth with the gingival tissue at this height would result in teeth that would appear too wide and unaesthetic. The radiographs show full root formation on the permanent central incisors, permanent canines, and primary cuspids (Fig. 2).

To visualize how 2-3mm gingi-

val reduction would affect the aesthetic result, the study model was prepared with a scalpel (Fig. 3). The casts were then sent to the laboratory for a wax-up of the proposed veneers at this anticipated tissue height, with all spaces closed anteriorly, but spaces placed at the distal of the primary cuspids (Fig 4). A surgical template was fabricated at this gingival height as an intra-oral guide for the minimal reduction that would allow for the crown length required (Fig. 5).

After measuring the depth of the gingival sulcus, and marking the depth using a labial punch through with a periodontal probe, inverse bevel incisions were used to create a gingivectomy at the maximum height allowed by the depth of the sulcus (Fig. 6). A frenectomy was performed because the frenum attachment was within 2mm of the gingival margin, creating the possibility of tissue pull and recession. Figure 7 shows the



**FIGURE 13**—3mm depth cuts on central incisors with pencil markings.



**FIGURE 14**—Rounding of incisal-labial line angles for adequate depth of porcelain.



**FIGURE 15**—Putty reduction guide over prepared centrals and cuspids to evaluate amount of reduction.



**FIGURE 16**—Spot acid etching for bonding of temporary composite veneers.



**FIGURE 17**—Temporaries as minimally trimmed with 12B blade and 7902 bur.



**FIGURE 18**—Try in of porcelain veneers with clear Prevue.

surgical template in place on completion of the gingivectomy. It shows that we have in fact created more tooth height at the surgical phase than the estimation on the working model.

A clear silicone impression was taken of the wax-up with Clearly Affinity (Clinical Research Dental) and then the lingual was cut back to 1mm below the anticipated lingual finish line of the porcelain veneers to facilitate fabrication of the temporary veneers. Affinity Putty (Clinical Research Dental) was used to fabricate a reduction guide on a study model fabricated from the wax-up. Pencil lines were marked on this model at the mid labial surfaces of the veneers and on the lingual surface of the cast distal to the cuspids. These lines are picked up by the putty as shown in (Fig. 9). These lines are then cut back with a #15 Bard Parker scalpel. The amount of reduction that is required for each tooth can then

be visualized (Fig. 10).

After tissue healing (Fig.11) the patient was then brought back for a final aesthetic evaluation of the wax-up and proposed positioning, shape and contour of the final restorations. The clear silicone matrix is used with Intro Esthetic Temporary Veneer Composite (Clinical Research Dental), light cured and trimmed. At this time signed patient consent is obtained for proceeding to the restorative phase.

It must be noted here that one method of reducing teeth requiring extensive repositioning is to use this mock-up as a framework for reduction. The Mock Up Driven Preparation as discussed by Dr. P. Magne<sup>25,26</sup> creates depth cuts through this mock up, to precisely control the amount of reduction required by each tooth. “Using this new laminate porcelain approach, clinicians should be able to produce not only more

accurate preparations, but also higher quality tooth preparations in a time-efficient manner. This type of work strategy, will provide a significant amount of diagnostic information and economy of tooth substrate, the importance of which can not be overestimated in the completion, functionality, and longevity of the final restoration”.<sup>25,26</sup>

At the preparation phase (Fig. 13) depth reduction grooves were placed to the required depth. The pencil lines mark the deepest part of the preparation, and every attempt is made to just barely remove the markings when reducing the labial surface, to minimize tooth removal. The preparation design is taken over the incisal edge with a butt margin, remembering to round over the incisal line angles to facilitate fabrication of the veneer, and to give height and depth for creation of incisal translucency (Fig. 14).



**FIGURE 19**—Lateral and cuspid porcelain veneers with opaque try in.



**FIGURE 20**—Try in complete with satisfactory colour match.



**FIGURE 21**—Placement of veneer with removal of gross excess with brush.



**FIGURE 22**—Spot cure in center of veneer only, to facilitate removal of excess cement.



**FIGURE 23**—Lateral porcelain veneer with opaque cement removal with brush.



**FIGURE 24**—After final light cure, excess can be trimmed easily with 12B blade.

The reduction guide is placed intra-orally to verify that the proper amount of labial reduction has been done (Fig. 15). After impressing in a stock fiberglass Border-Lock Tray (Clinical Research Dental) with Affinity Heavy and Light Body polyvinyl siloxane (Clinical Research Dental), the teeth are spot etched (Ultra-Etch Ultra-Dent) (Fig. 16), and D/E Bond Resin (Bisco) is applied to the enamel to seal the surface and create a bond in the etched areas only. The clear matrix, filled with medium incisal and B1 (Intro Clinical Research Dental) is carried to the prepared teeth, adapted to the gingival tissue on the labial, and the lingual excess is removed.

The temporary composite resin is then light cured just enough so that when the matrix is removed, the excess flash can then be removed easily with a 12 B Bard Parker blade. Once the gross excess is removed the final

light cure of the temporaries is done. Figure 17 shows the temporary veneers after light trimming with the blade and a 7902 multi-fluted bur. In this case, there has been too much medium incisal shade placed.

At insertion the temporary veneers are then easily removed with a discoïd cleoid or sectioned with a bur, and the surfaces are pumiced to remove any contamination. A try-in paste (Prevue Cosmedent) which matches the post-cure state of the luting resin cement is used to evaluate the colour and value of the veneers prior to final cementation (Fig. 18).

Remember that the try in pastes do not take into account the yellowing effect of our bonding systems, and that most composites used to cement porcelain veneers darken over time.<sup>27</sup> In an in-house six month study, rapid aging of Cosmedent Insure in hot water did not result in a colour change.\* Never use a dual-cure

luting resin under porcelain veneers due to their colour shift over time. If in doubt use a lighter shade. Figure 18 clearly shows the shine through of the permanent cuspids. Clear and opaque are mixed in various proportions to mask the yellow of the permanent canine and increase the value of the veneer (Fig. 19).

These proportions are changed until the final shade match is appropriate (Fig. 20). The veneers are then cleaned with phosphoric acid, washed, and a monolayer of silane (UltraDent) and D/E resin (Bisco) is applied. The proper mixture of luting composite (Insure Cosmedent) is mixed and placed on the bonding surface of the veneers, which are then placed in a Resin Keeper (Cosmedent). The teeth are then cleaned with a pumice, etched in pairs, a dentin enamel bonding agent One Step Plus (Bisco) is applied in two coats, air evaporated, and the pairs of veneers placed on the teeth (Fig. 21). The excess luting

composite on the labial and lingual can be easily removed after spot curing the veneer in the center with an Ultra-Lume 5 and PointCure lens (Ultra-Dent) (Fig. 22).

Figure 23 shows the lateral and cuspid veneer being cemented with the Opaque mixture. The remaining luting composite can be easily removed with a 12B Bard Parker blade (Fig. 24). It is critical not to create a ditch at the gingival margin when marginating porcelain and trimming excess luting resin. Remember that porcelain polishing paste when taken subgingivally on a rubber cup, will preferentially remove cementum creating a ditch and sensitivity. Figure 25 shows the immediate post operative result after adjusting protrusive and lateral protrusive excursions. The two week postoperative result is shown in Figure 26 and a comparison of the before and after in Figure 27.

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*The author wishes to thank and acknowledge Rotsaert Laboratories, Hamilton, for their assistance with this case and for fabricating the porcelain veneers for this case. \* A special thanks to POW Laboratories for running the in-house rapid aging test on Cosmedent Insure Luting Cement.*

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FIGURE 25—Immediate post insertion result.



FIGURE 26—Two week recall to verify occlusion and finishing.



FIGURE 27A & B—Comparison of before and after result.

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*Oral Health welcomes this original article.*

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