by Dr. Robert "Tito" Norris

Dr. Robert "Tito" Norris is a 1992 graduate of the University of Texas Health Science Center at San Antonio School of Dentistry. Norris completed a general practice residency at the VA Medical Center in Washington, D.C., followed by orthodontic specialty training at Howard University, graduating as valedictorian with the highest GPA in the program's 25-year history.

After serving as a U.S. Air Force orthodontist in Misawa, Japan, Norris returned to San Antonio in 1998 and opened a private orthodontic practice. He holds several patents and trademarks, and is the inventor of the Norris 20/26 Passive Self-Ligating Bracket System.

Norris is board-certified by the American Board of Orthodontics, and is a member of 10 dental organizations and study clubs. He lectures internationally on topics including aesthetics, efficiency, sustainability, customer service, accelerated treatment and aligner treatment.

Cuspid Substitutions

Techniques for predictable excellence

Maxillary lateral incisors are some of the most commonly missing teeth, second only to mandibular premolars.[1] When a lateral incisor is missing, there is a high aesthetic requirement to make the replacement tooth look natural because of its location in the aesthetic zone. Currently, there are four options for replacing a missing maxillary lateral incisor:

- Removable partial denture (RPD).
- Fixed partial denture (FPD), or "bridge."
- Dental implant.
- Cuspid substitution.

Weighing the pros and cons

The first three options necessitate precise orthodontic treatment so that the space for the lateral incisor restoration is 80% of the width of the maxillary central incisor. Most maxillary central incisors are between 8 and 9 mm in width; therefore, the appropriate width for a maxillary lateral incisor should be 6.4–7.2 mm.

An advantage of an RPD is that fabrication is relatively inexpensive. An RPD can be as simple as a resin pontic tooth affixed to an acrylic or "slipcover" retainer. However, this style of RPD is typically not very durable, and is often taken out for meals. This can cause an embarrassing situation and increases the risk of loss or damage of the RPD if it is left on a napkin or stuffed in a pocket. A more elaborate and durable cast RPD can be fabricated at an increased cost, but this style of RPD often requires creating preparations within enamel to serve as rests to stabilize the appliance. For these reasons, RPDs are not considered a long-term treatment of choice for most patients.

An FPD requires some preparation of adjacent teeth, depending on the design. These designs vary from a conservative Maryland bridge to a cantilever pontic bridge to a conventional crown-supported bridge. No matter the design of the FPD, careful attention must be paid to the gingival architecture and development of papilla. This is often most successfully accomplished with an ovate pontic to tissue-mold the edentulous space into nat-

ural-appearing gingival contours around the pontic. Tissue molding must be carried out under the careful hands of a skilled restorative dentist, and sometimes requires the assistance of soft tissue grafting to be successful. Another challenge of an FPD is cleansibility, and studies have shown that there is more gingival inflammation in FPD patients than in patients with natural teeth.[2]

Dental implants have long been considered the gold standard for replacing a missing tooth. However, dental implants cannot be placed in growing teens, because dentofacial growth is not complete. If a dental implant is placed before growth is complete, the implant will eventually appear to be in infraocclusion as the adjacent teeth continue to grow and change around it.[3] In fact, even in mature adults, studies have shown that the face is still changing and growing through the fourth decade of life and infraocclusion of dental implants in the aesthetic zone can still occur.[4] Another challenge of dental implants in the aesthetic zone is that more than half of them show noticeable color change of the overlying gingiva after five years.[5]

On the cusp...ids

Cuspid substitution allows a natural tooth to remain in the aesthetic zone; however, there are key considerations to optimize the option's aesthetics and function.

Preorthodontic sculpting

Before brackets are bonded to the cuspid that will serve as a lateral incisor, the cuspid should be sculpted with burs and composite to resemble a lateral incisor of the appropriate size: 80% of the width and length of the central incisor (Figs 1a–1k).

A step-by-step guide follows on the next page.

Figs. 1a and 1b: *Left maxillary cuspid before and after lateralization.*

Figs. 1c and 1d: *Flattening the facial surface with a diamond disc bur.*

Figs. 1e and 1f: *Reducing the width mesially and distally with a straight diamond bur.*

Figs. 1g and 1h: *Reducing the incisal edge with a diamond disc bur.*

Fig. 1i: *Reducing the lingual prominence with a diamond disc bur to produce a flat lingual surface.*

Figs. 1j and 1k: *Adding composite to the mesiofacial and distofacial line angles and creating proper mesioincisal and distoincisal contours to simulate a lateral incisor.*

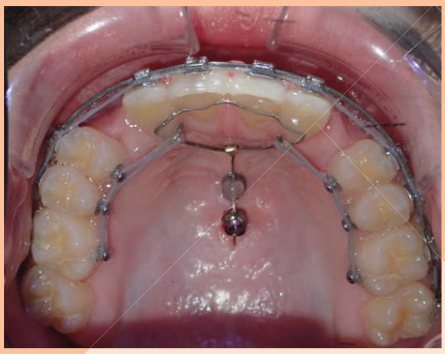


Fig. 2: *Y-bar fabricated with 0.016-by-0.022-inch stainless steel wire secured into two palatal self-ligating 1.5-by-9 mm spider screw TADs. Note lingual buttons on premolars.*

Fig. 3a

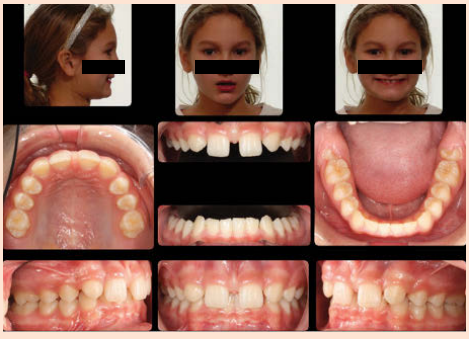


Fig. 3b

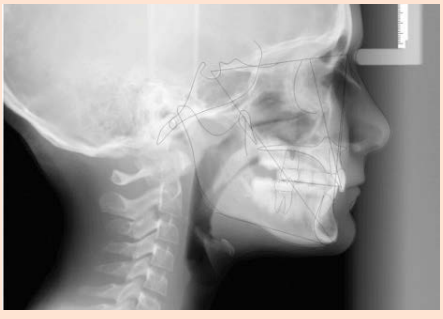


Fig. 3c

1. Flatten the facial surface with a diamond disc bur.
2. Reduce the width mesially and distally with a straight diamond bur.
3. Reduce the incisal edge with a diamond disc bur.
4. Reduce the lingual contour with a diamond disc bur.
5. Add composite to the mesiofacial and distofacial line angles and create proper mesioincisal distoincisal contours to simulate a lateral incisor.

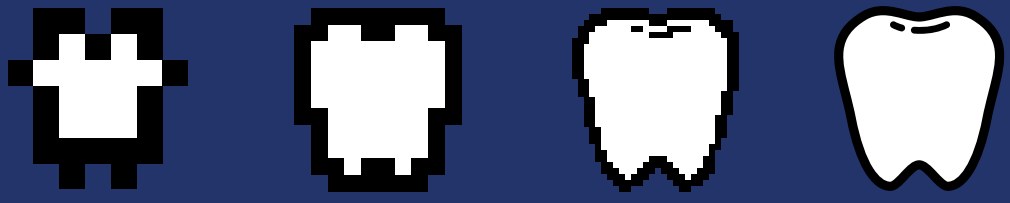
Push, don't pull

A common complaint of dentists is that cuspid substitution cases appear too narrow. I believe this is often because of the use of elastic chains to close spaces between maxillary centrals and cuspids. Elastic chains constrict, whereas open-coil springs expand. Use open-coil springs between the first premolar and the cuspid to close any space between the new "lateral incisor" and the central incisor. Open-coil springs can also assist in centering midlines in unilateral missing lateral cases.

Intrude the first premolar

A maxillary premolar is approximately 3 mm shorter than a maxillary cuspid. Therefore, to achieve appropriate gingival architecture, the bracket of the first premolar should be moved 3 mm occlusally when it is first bonded. This will provide adequate time for the premolar to intrude as wire sizes are increased during treatment. Once the premolar is positioned in a Class I relationship with the lower cuspid, it will need composite restoration to lengthen it to its appropriate cuspid length and contour. Eventually, the tooth should be restored with a more definitive long-term restoration such as a porcelain veneer or crown.

Orthodontics Continually Evolves



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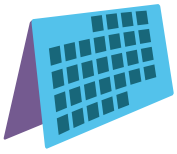
Figs. 4a-c

Figs. 5a-c

Figs. 6a-c

Figs. 7a-c



Next month: Go inside the practice

In our October 2021 issue, Dr. Robert "Tito" Norris gives us a tour of Stone Oak Orthodontics, his practice in San Antonio, Texas, and discusses how his mechanical engineering background helped him succeed as an orthodontist.

Place the new "cuspid" in group function

To protect the smaller root of the premolar serving in the cuspid position, group function occlusion is advised so that the lateral excursive forces can be shared among all teeth in the buccal segment.

Use a Y-bar to protract maxillary posterior teeth

Once the maxillary midline is on to the face, the new "lateral incisor(s)" are properly aligned, and all incisors are adequately coupled with the lower incisors, then it is time to lock them in place via indirect palatal anchorage. Two 1.5-by-9 mm Spider Screw TADs with self-ligating heads are placed in the midline of the palate approximately 10 mm apart, and an impression is made so that a 0.019-by-0.025-inch stainless steel Y-bar can be fabricated and locked into place (Fig. 2, p. 32). This Y-bar is then adhered to the lingual surfaces of all four maxillary incisors, providing absolute indirect skeletal anchorage. Now remaining posterior spaces can be efficiently closed on a broad 0.019-by-0.025-inch stainless wire by using facial and lingual elastic chains. The lingual elastic chains are attached to lingual buttons bonded to all posterior teeth, and the elastic chains are terminated onto hooks integrated within the Y-bar.

Flip the 6s

When cuspid substitution is planned for missing maxillary lateral incisors, it typically results in the molars finishing in a Class II relationship. This means that the palatal cusp of the upper first molar will rest on the marginal ridges of the mandibular first molar and second premolar, rather than in the central fossa of the mandibular first molar.

Therefore, the palatal cusp of the maxillary first molar must be more occlusal than it normally is. So, more facial root torque is needed. Similarly, less rotation is desired on the maxillary first molar because of its relationship with both the mandibular second premolar and first molar.

The bracket that has more facial root torque and less rotation is the mandibular first molar bracket of the contralateral arch (typically 22 degrees of torque and 0 degrees of rotation). This will aid in first molar fit and finish.

When the aforementioned principles are consistently applied, cuspid substitution cases can predictably provide optimal aesthetics combined with a natural tooth in the esthetic zone which will grow, change, and induce bone formation as the patient continues to grow

Elastic chains constrict, whereas open-coil springs expand.

and change. Eventually the provisional composite restorations can be replaced with more definitive porcelain restorations, enhancing the long-term aesthetic prognosis.

Case study

A 10-year-old patient presented with a chief complaint of maxillary spacing and missing maxillary lateral incisors #7 and #10 (Fig. 3a, p. 32). She had a deep bite and an Angle's Class II molar and canine relationship. Clinical examination of her short clinical crowns hinted at early signs of altered passive eruption, but because of her young age and growth potential, a definitive diagnosis could not be made at that time. The cephalometric radiograph (Fig. 3b, p. 32) revealed that she was brachycephalic and slightly bimaxillary retrusive. However, her maxillary incisal angulation was ideal. The panoramic radiograph (Fig. 3c, p. 32) was unremarkable, with the exception of the missing teeth #7 and #10.

The patient was treatment-planned for cuspid substitution, converting the maxillary cuspids to lateral incisors and the maxillary premolars into cuspids. The molars would remain Angle's Class II.

The cuspid conversion procedure described earlier was followed as tooth #6 was reshaped to resemble missing tooth #7 and tooth #11 was reshaped to resemble #10. Brackets with an 0.020-by-0.026-inch slot (Norris 20/26) were placed, paying particular attention to move the maxillary first premolar brackets 3 mm to the occlusal to begin intruding those teeth that would eventually serve as maxillary cuspid teeth. Mandibular molar brackets with 0 degrees of rotation and 20 degrees of torque were placed on the maxillary molars to enhance the fit of the molars in an Angle's Class II relationship. Bite turbos were placed to disclude her occlusion. A 0.014-inch Norris Extra Broad NiTi archwire was placed at the initial visit (Figs. 4a–4c).

The normal Norris 20/26 system archwire progression was followed, and an 0.018-by-0.018-inch Norris Extra Broad NiTi wire was placed at her next appointment (Figs. 5a–5c). Subsequently, a 0.019-by-0.025-inch NiTi wire was placed, which completed the intrusion of the maxillary first premolars, continued arch development and provided a strong enough wire on which excess spaces could begin to close using elastic chains and Class III elastics (Figs. 6a–6c).

Once the maxillary first premolars reach an ideal Class I relationship with the lower canines, then the orthodontic brackets are removed from them and composite resin is added to convert them to canines. Note that when the brackets are replaced after the bonding procedure, they are sometimes placed in an even further incisal position to further

Fig. 8a

Fig. 8b

Fig. 8c

Fig. 8d

intrude the new "canines" to idealize the final gingival architecture. (Figs. 7a–7c, p. 34). Eventually, the canines are positioned in a group function role, whereby the posterior teeth share lateral excursive forces with the new maxillary premolar that is serving as a cuspid.

Upon completion of orthodontic treatment, bonded lingual retainers were placed and the patient was fitted with vacu-form retainers for nighttime wear (Figs. 8a–8d). The patient and parent were informed that she will likely need osseous crown lengthening to establish ideal posterior gingival heights and that long-term restorations such as porcelain veneers on the maxillary laterals and cuspids are also indicated once growth is complete. Normally the timing of the crown lengthening and final restorations occurs after the age of 16 in females and after the age of 18 in males. ■

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