Dr. Robert Lowe is one of the great teachers in dentistry. Recently, he received the Gordon J. Christensen Award from the Chicago Dental Society in recognition of his excellence in teaching. Some of my favorite continuing education experiences have been sitting in Dr. Lowe's class learning how to improve my clinical dentistry. He always provides great practical information.

Gary M. Radz, DDS
Editor-in-Chief

Perspectives:

Prosthetic Tooth Repositioning Is a Viable Treatment Option for Select Cases

By Robert A. Lowe, DDS

For many years, patients with esthetic and functional problems resulting from tooth malposition have had few treatment options. Orthodontics is the first option to correct tooth malposition; however, not all patients are willing to follow through because of the length of time it takes to complete treatment. In a certain percentage of these cases, orthognathic surgery is also suggested to correct maxillary and mandibular jaw position before orthodontic therapy. Often, the patient is still faced with the prospect of restorative dentistry to gain a full esthetic and functional correction when these therapies are completed. Therefore, many patients never have the opportunity to receive the treatment they seek unless they agree to this lengthy regimen.

With the advent of dentin bonding and the advancements in dental porcelains, elective esthetic dentistry

Figure 1—Preoperative view of the patient's smile shows the facial prominence of the maxillary central incisors. Because of their labial position, the smile line was concave and lip support was excessive.

Figure 2—Occlusal view of the maxillary arch shows that out of the maxillary 6 anterior teeth, the left lateral incisor and cuspid were in the most favorable position as far as the proposed final arch form was concerned. The right cuspid was rotated mesiofacially, the right lateral incisor was crowded out of the arch form toward the lingual aspect, and both central incisors were flared labially.

Figure 3—Enameloplasty was performed on the maxillary right cuspid and central incisor to bring these teeth back into arch form. Because the lateral incisor was palatally positioned, very little facial reduction was needed on this tooth.

Figure 4—Depth cuts were made to prepare the teeth to make room for the restorative material. Note the minimal preparation on the facial surface of the maxillary right lateral incisor.

Figure 5—Approximately 2 mm of free gingiva were removed from the facial aspect of the maxillary right lateral incisor to correct the cervicoincisal height of the tooth. A 1-mm gingival sulcus remained after laser surgery to preserve the biologic dimension.

Figure 6—The definitive restorations, including facial veneers on the maxillary first and second premolars, were tried on and approved by the patient.

Figure 7—Postcementation view of the maxillary arch.

has never before been in such high demand. For a select group of these patients with minor tooth malposition—such as spacing (diastemas), crowding (mesial and/or distal overlapping), and facial-lingual arch form displacement—esthetic and functional correction may be accomplished purely by restorative means. However, the patient must understand that correction of these malpositions will require a more aggressive preparation of the teeth involved to align the arch form. A diagnostic wax-up is absolutely necessary to help determine the amount of tooth preparation that will be required. A preparation guide (silicone or plastic stent) is fabricated from the diagnostic wax-up and approved by the patient. In some cases, intentional endodontics is required to gain the proper space for the correction of tooth position. It is imperative that the patient be aware of this possibility before any treatment is started. However, as long as the patient is fully informed of all treatment options, they should have the opportunity to pursue this type of elective treatment if that is what they desire.

Case Preparation

To determine whether a patient is a candidate for prosthetic tooth repositioning, mounted study casts are required. It is recommended that the models be duplicated so that a preoperative model can be kept as part of the permanent record. The duplicate model is prepared to assess how much tooth reduction is required to gain an optimal result. Depth cuts and preparation dimensions can be recorded for use during the operative phase of treatment. Once the teeth are prepared, a wax-up is done to correct tooth contour and position. Keep in mind the proper tooth length and width when designing the esthetics (the "Golden Proportion") of the case. When preparing a crowded dentition, the first step is to perform an enameloplasty on teeth that are outside the proposed arch form to bring them into better alignment. Next, the proximal contacts between are broken. Crowded or overlapped teeth will require "wraparound" veneers or full-coverage crowns. It is recommended that a very thin diamond instrument, such as a 30-µm interproximal composite finishing diamond, be used to shape opposing proximal surfaces and vertically break the contact between the

Figure 8—The patient's postoperative smile.

Figure 9—Preoperative full-arch retracted view shows the amount of crowding present in this class II, division 1 case.

Figure 10—Preoperative maxillary arch incisal view shows the rotation and crowding of the maxillary anterior segment.

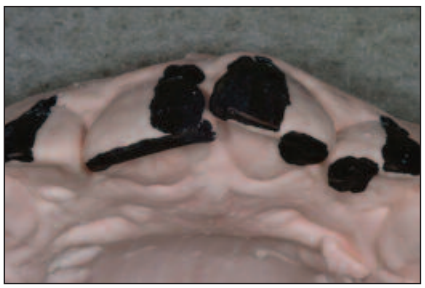

Figure 11—Incisal view of the preoperative cast shows the areas in black that need to be reduced to bring the teeth into proper arch form before reducing for the restorative material.

Figure 12—The completed maxillary and mandibular composite mock-up.

Figure 13—Areas of the teeth that needed reshaping as determined on the preoperative cast were marked on the patient's teeth before preparation.

roots. These surfaces can later be highly polished with fine curets. One key to good results is having adequate interradicular space for development of a healthy gingival papilla that is easily cleansable by the patient. Teeth that are out of line in the buccolingual dimension must be corrected by overpreparing the side of the tooth that is out of alignment. The opposite side of the tooth, in most cases, will only need slight preparation in the marginal area. It is important to mention that so-called "no-prep techniques" cannot possibly correct misalignment of functional surfaces without adding thickness to the tooth form, resulting in overcontoured teeth.

Case Report 1

A 23-year-old man presented with a class II, division 1 malocclusion with excessive overjet and labial flaring of the maxillary central incisors (Figures 1 and 2). His desire was to have an esthetic correction in the smile zone to improve his overall appearance and self-esteem. After initial consultation, he was advised to seek an orthodontic consultation to help meet his esthetic objectives. At a follow-up reconsultation visit, the patient related that the orthodontist wanted an orthognathic consult to correct the deficiency in maxillary and mandibular jaw position before starting orthodontic treatment. The patient was adamant about not wanting to undergo jaw surgery, but he was interested in pursuing an esthetic restorative solution. It was explained that the tooth position could be addressed; however, the jaw relationship, which was manifested in a deep overbite, could not be totally corrected. Diagnostic models were taken and a wax-up was done. The patient reviewed the wax-up and was satisfied with the correction. He was advised of the possibility of root canal therapy, particularly on the maxillary central incisors because of the excessive labial flare. It was also decided to place porcelain veneers on the maxillary premolar teeth to build out the buccal corridor because of the constricted arch form and the prominence of the maxillary cuspids.

The first step in the preparation phase was to align the teeth to the desired preoperative position (with enameloplasty and dentinoplasty) (Figure 3). Next, 1.5-mm depth cuts were made to make room for the restorative material (Figure 4). Tooth preparation was then completed using conventional high-speed diamond instrumentation. A diode laser (Twilight by Biolase Technology, Inc) was used to make a correction of the tissue level above the maxillary right lateral incisor (Figure 5) to match the

Figure 14—Provisional stents were used as preparation guides to evaluate for proper tooth reduction.

Figure 15—Maxillary arch incisal view of the completed case.

Figure 16—Retracted facial view of the completed case.

cervicoincisal height of the contralateral lateral incisor. There was an adequate amount of free gingiva present to avoid correction of the alveolar bone level.

Once the tooth preparations were complete, a preparation guide made from the diagnostic wax-up was placed to verify adequate tooth reduction. This stent was also used to fabricate the provisional restorations to give the patient and the dentist a good idea of what to expect in the definitive restorations. Arch form, tooth position, smile line, incisal edge position, anterior guidance, overbite-overjet relationships, and tooth color were some of the parameters that were evaluated while the patient was wearing the provisional restorations. The maxillary bicuspids were very conservatively prepared for facial veneers at the time of the final impressions.

After a period of evaluation of 4 to 6 weeks, the final impressions were taken for this case. Although the patient was informed of the possibility of intentional endodontics, no pulpal exposures or near exposures were encountered. The ceramic restorations were tried on the preparations, and the patient was asked to approve the result. The definitive restorations were then bonded in place using resin cement. Figures 6 through 8 show various views of the completed rehabilitation. Compare these to the preoperative views in Figures 1 and 2. Esthetic and functional parameters have been considerably improved. The facial inclination of the maxillary central incisors and the lingual inclination of the lateral incisors have been improved as well. As a result, in 2 appointments 6 weeks apart, the patient underwent an esthetic and functional rehabilitation that he was completely pleased with. The treatment met all of the patient's preoperative expectations without lengthy orthodontic treatment or maxillofacial surgery. It should be emphasized that all cases of these types cannot be treated without surgery and/or orthodontics. However, patients should be aware that, in some select cases, they can acquire a beautiful result via esthetic restorative dentistry only—and they should be given the option to do so.

Case Report 2

A 41-year-old woman presented with a class II, division 1 malocclusion with normal overjet and crowding of the maxillary and mandibular anterior segments (Figures 9 and 10). The areas of tooth structure outside the proposed arch form were marked on the preoperative study model (Figure 11). For labiolingual malpositions, the proposed arch form is positioned halfway between the most facially positioned tooth and the most lingually positioned tooth. This allows for more conservation of tooth structure by not making a full correction on any one malpositioned tooth. It is important to inform the patient that cases of this type will often require correction of both arches because with normal overjet, the mandibular malpositioned teeth will get in the way of correcting the maxillary teeth in the lingual direction if only a maxillary arch alignment correction is attempted. Again, this must be veri-

Prosthetic tooth repositioning is a viable treatment option for select malocclusions that require esthetic and functional correction. The stability of these cases has been shown clinically when proper guidelines have been followed.

Figure 17—A 3-year postoperative view of the completed case.

Figure 18—Preoperative full-arch retracted view of a patient in centric relation with no posterior tooth contact and no temporomandibular joint symptoms at the time.

Figure 19—As the incisal edges of teeth Nos. 7 through 10 were reduced out of contact, the posterior teeth began to come into contact.

Figure 20—Maxillary arch view showing contacts of the posterior maxillary teeth with the incisal reduction of teeth Nos. 7 through 10.

Figure 21—Tooth preparation of the maxillary incisors completed for all-ceramic restorations.

Figure 22—After placement of the ceramic restorations, contacts in the posterior region can now be seen back to the first molar region, giving this patient a more stable intercuspation in centric occlusion.

fied by a preoperative cast preparation and a composite mock-up first (Figure 12). If the case is determined to be reasonable to perform, the mock-up must then be approved by the patient to see if the proposed correction will meet their expectations. If desired, the actual teeth can be marked in the same fashion as the study models with a sterile marker to show where the teeth need to be reshaped before depth-cut placement and tooth preparation for the restorative material (Figure 13). Clear provisional stents made from the composite mock-ups can also serve as three-dimensional preparation guides to verify proper tooth reduction (Figure 14). A completed maxillary arch incisal view and postoperative facial view are shown in Figures 15 and 16. Compare these to the preoperative views (Figures 9 and 10) to visualize the prosthetic corrections. A 3-year postoperative full-arch retracted facial view is shown in Figure 17. This case has been esthetically and functionally stable during this period of time.

Case Report 3

A 58-year-old man presented with occlusion on the anterior teeth only and had no posterior tooth contact (a preoperative retracted view of the patient positioned in centric relation is shown in Figure 18). He had been told that his only option was to have jaw surgery. After mounting the preoperative study models in centric relation on a semiadjustable articulator, it was determined that if the maxillary anterior arch form could be expanded slightly facially, it may allow the mandible to close and the posterior teeth to contact. When the maxillary teeth Nos. 7 through 10 were reduced incisally (Figures 19 and 20), the posterior teeth came into contact. Therefore, the operative plan was to prepare teeth Nos. 7 through 10 (Figure 21) and place 360-degree ceramic restorations to correct the arch form in the facial direction and tilt the long axis of the crowns slightly toward the facial aspect. As the incisal edges were shortened, the posterior teeth came into contact. Once this occurred, the teeth were then depth-cut on the facial and palatal aspects to allow for the thickness of the ceramic material. Figure 22 shows the completed case after the 4 maxillary incisor restorations were delivered. Note the functional contact that now exists in centric occlusion for the patient. Although the crossbite cannot be addressed without restoring the posterior teeth (ie, a full-mouth reconstruction), the patient has gained a stable occlusal situation by the restoration of 4 teeth without invasive orthognathic surgery.

Conclusion

Prosthetic tooth repositioning is a viable treatment option for select malocclusions that require esthetic and functional correction. The stability of these cases has been shown clinically when proper guidelines have been followed. In this author's opinion, it has been editorialized by some specialists that this type of treatment is "a quick-fix cop-out" and that patients should be talked into the ortho/surgical approach for all of these types of cases. But just ask the patients presented in this article if the sacrifice of a little more tooth structure vs the more "conservative" surgical approach has been worth it for them. It is always best to present the options and let the patient help decide the course of treatment that best suits their needs. ■