

Multi-Disciplinary Treatment Success: Determining the Endpoint First

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INTRODUCTION

Many patients want to improve their smiles, yet they do not move forward with the suggested treatments. They are often not sure how to begin, or they assume that a tremendous amount of dentistry will be necessary to achieve their desired smiles. As clinicians, we must thoroughly understand what the patient hopes to achieve and what factors may limit his or her ability to reach his or her goal(s). Particularly when treatment plans involve multiple disciplines, the patient's concerns—finances, time, fear, and/or risk—must be clearly understood and communicated to all the interdisciplinary team members.

When the smile design¹ is done at the beginning of the examination, a desired clinical endpoint is identified and can be evaluated based on other clinical conditions and modified, if necessary, to minimize any biologic or functional risk. The critical step of integrating the dental clinical endpoint with the facial framework can be moved to the start of treatment. This information can then be easily discussed and shared with all the team members prior to the finalization of the treatment plan.

CASE REPORT

Diagnosis and Treatment Planning

At the initial examination, this 47-year-old patient desired to change her smile but was apprehensive about what would be involved (Figure 1). She worried that aggressive dentistry would be necessary to solve her problems. She was congenitally missing tooth No. 7. As a teenager, tooth No. 6 had been orthodontically moved into the lateral incisor position. The upper right primary cuspid was present distal to tooth No. 6, and tooth No. 10 was a peg lateral. A previous dentist had placed direct bonding on tooth No. 10 to close the interproximal spaces, but spacing continued to develop (Figures 2 and 3).



Figure 1. The preoperative photo shows the aesthetic challenges that presented with asymmetrical tooth shapes, color, and spacing.



Figure 2. The tooth size discrepancy was noticeable in this pre-op photo.



Figure 3. A frontal view also reveals concerns with the angulation of the central incisors.

The clinical examination revealed a healthy periodontium (AAP Type II) and a low biomechanical risk, with few restored teeth and no active caries since childhood. She had no functional concerns and was diagnosed with acceptable function (Figure 4).

The starting point was to design a smile within the framework of the face. This proposed smile design was shared with the orthodontist and the periodontist. The team evaluated the photos and all of the diagnostic information, then discussed any potential complications that might limit the ability to achieve this identified endpoint. This collective discussion led to a treatment plan with all phases clearly defined and explained to the patient.

Tooth No. 6 would be orthodontically moved into its correct location after the removal of the retained primary cuspid. Correct spacing for teeth Nos. 7 and 10 would be created. Four months prior to the completion of orthodontics, an implant would be placed to replace tooth No. 7, allowing integration to be complete when the orthodontic brackets would be removed. The smile design included a wider buccal corridor and a leveling of the occlusal plane, followed by the placement of no-prep or minimal-prep veneers on all teeth.

Clinical Protocol

Phase 1: Orthodontics

Prior to the start of the orthodontic phase, the existing direct bonding was removed from the mesial of teeth Nos. 6 and 10. Direct bonded composite was placed on tooth No. 10 to create ideal width and length proportions. This communicated the exact space specifications to the orthodontist, eliminating the need to estimate the space to be created. The bonding also provided a template for the orthodontist to duplicate the space requirement on the contralateral side for implant placement. As the space for the implant was created, a temporary tooth was placed on the orthodontic bracket for aesthetics and was periodically adjusted to meet the changing space requirements.

Including the orthodontist in the preoperative smile planning was critical in creating a final orthodontic position of the teeth that would accommodate veneer placement in the desired position without the need to remove any tooth structure. Without this communication, the teeth may have been placed in an incorrect final aesthetic position, which would have resulted in the unnecessary preparation of tooth structure.

A Highly Aesthetic Outcome in a Challenging Case

By Nelson A. Rego, CDT

One of the most challenging situations a ceramist can encounter is creating restorations that blend seamlessly when there is a combination of minimal-prep/no-prep veneers and teeth that have been previously prepared or are missing. This case presents a novel approach that can help to minimize these challenges and increase the aesthetic predictably for patients.

After a review of the preoperative records and the selected dental aesthetic endpoint, the dentist and

dental technician met to discuss potential laboratory fabrication challenges that would impact the team's ability to deliver the desired outcome. The orthodontic treatment would align the dentition, which would minimize the necessary removal of tooth structure. When the teeth were moved into their proper positions, it appeared that a minimal tooth reduction of 0.3 mm would allow enough room for aesthetic, natural-looking restorations. Ceramic restorations that are of uniform thickness typically result in the most realistic restorations. The missing tooth would be restored first, with the goal of creating a prepped tooth that would match the contralateral tooth in shade and shape. Then all the teeth would be restored with minimal-thickness veneers.



Figure A. A full-contour restoration was waxed to exactly match the shape of the contralateral tooth.



Figure B. The restoration for tooth No. 7 was pressed with the goal of closely matching the chroma and value of the existing teeth.



Figure C. The platinum foil was cut and then adapted to the dyes.



Figure D. Multiple layers of feldspathic porcelain were applied to mimic the natural dentition.



Figure E. The finished restorations (shown here just prior to the removal of the platinum foil).

The case was scanned for a Digital Custom TiBase using a D2000 3-D Scanner (3Shape) and an Atlantis

FLO scan body (Dentsply Sirona). A full-contour restoration for tooth No. 7 was waxed with the goal of exactly matching the shape of the contralateral tooth No. 10 (Figure A). The restoration for tooth No. 7 was pressed using a lithium disilicate LT A1 ingot (IPS e.max [Ivoclar Vivadent]) with the goal of closely matching the chroma and value of the existing teeth (Figure B). Feldspathic porcelain was chosen as the restorative material to meet the patient's high aesthetic demands. The platinum foil technique is ideal for use with minimal-prep or no-prep cases. The platinum foil (Ivoclar Vivadent) was cut and then carefully adapted to the dyes (Figure C), including the IPS e.max framework on tooth No. 7. A thin layer of dentin and enamel (EX3 [Kuraray Noritake Dental]) was applied as a wash bake. Various layers of porcelain were layered to mimic the appearance of the patient's natural dentition (Figure D). After the porcelain was layered and baked, a silver contour check powder/liquid was applied to review the contours. Next, the restorations (Figure E) were hand polished and the platinum foil was removed. The finished restorations were etched with 12.5% hydrofluoric acid gel for 2 minutes, rinsed, and dried, then packed and shipped to the dental office.

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Phase 2: Implant Placement

A provisional restoration was inserted for tooth No. 7 when the implant was placed to allow soft-tissue contours to form (Figures 5 and 6). While the determinants of peri-implant aesthetics are not dependent upon a provisional restoration,² they can serve as a valuable communication tool for the restorative dentist and the laboratory technician. The tissue contours around the provisional restoration provide information to the restorative team about aesthetic limitations in the final restoration.² The provisional emergence profile was concave on the facial to facilitate maximum facial tissue height. The provisional cervical neck width was reduced as much as possible to match tooth No. 10, although final width adjustment would be made in the final restorations.

One of the aesthetic challenges was to create uniform interproximal papilla height bilaterally because the interproximal bone height on the implant and the distal of tooth No. 8 were more cervical than on the contralateral side. The bone levels could be made more symmetrical by orthodontically extruding tooth No. 8, which would bring the interproximal and facial bone down further incisally. However, this would necessitate the removal of incisal edge tooth structure to satisfy the proposed smile design. After a discussion with the patient, it was decided that the tissue height differences were not noticeable enough to justify adding biomechanical risk by removing tooth structure from tooth No. 8.



Figure 4. The pre-op radiograph revealed a minimally restored dentition with good bone levels.



Figure 5. The provisional restoration on the implant for tooth No. 7.



Figure 6. After orthodontics, the angulation and asymmetrical spacing had been corrected.

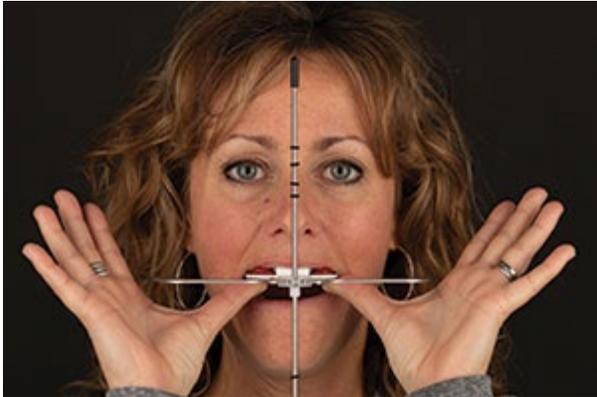


Figure 7. A Face-Bow (Panadent) registration was taken.



Figure 8. The custom impression coping in place for the final impression.



Figure 9. Spot-etching the teeth prior to placement of the provisionals.



Figure 10. A close-up photo that was sent to the dental laboratory team for the creation of the final restorations.



Figure 11. A photo illustrated any minor



Figure 12. A close-up of the final smile.

changes to be made in the final veneers.



Figure 13. The successful restoration of the no-prep veneer adjacent to the implant crown.



Figure 14. After completion, the left side was now harmonious with the right.

Phase 3: Retention

After the completion of the orthodontic treatment, the patient wore retainers nightly for 6 months to provide adequate time for stabilization of the tooth position. At this time, a minor occlusal adjustment was done, and the restorative treatment could proceed predictably. While the patient was in retention, intensive whitening treatment was provided. The planned veneers would be thin, so the aesthetic result would be impacted by the shade of the underlying tooth structure. Crown lengthening was performed on tooth No. 10 to match the gingival zenith of tooth No. 7.

Phase 4: Lab Team Communication

Detailed communication with the dental laboratory team is critical to successfully implementing the initial smile design. Excellent photo and video documentation enables the lab technician to “see” the patient and evaluate soft-tissue variables, such as lip dynamics and lip closure paths. The records taken and sent to the laboratory team (Smile Designs by Rego in Santa Fe Springs, Calif) included a Face-Bow (Panadent), upper and lower full-arch vinyl polysiloxane (VPS) impressions (Aquasil Ultra [Dentsply Sirona]), a bite registration (Futar D Fast [Kettenbach LP]) in maximal intercuspal position (MIP), a digital measurement of one tooth to cross reference with the lab models, and a stick-bite to verify cross-mountings (Figure 7). The technician understood that no-prep/minimal-prep veneers were planned. After evaluating the mounted models, the technician and clinician discussed that a slight reduction in the cervical third of tooth No. 11 would be necessary to accommodate the path of insertion. The wax-up was then created to reflect those clinical parameters, and a Sil-Tech Putty (Ivoclar Vivadent) stent was created over the wax-up. Feldspathic porcelain would be used to fulfill the aesthetic goals and the minimal-prep requirement.³



Figure 15. A beautiful result and a happy patient!

Phase 5: Restorative Treatment

At the final impression appointment, tooth No. 11 was slightly reduced in the cervical third as planned. The Sil-Tech Putty matrix was filled with a bis-acryl provisional material (Luxatemp Ultra [DMG America]) and seated directly over the unprepped teeth. The bis-acryl was allowed to be fully cured in the mouth, and then the template was removed to visualize the new prototype. Depth cuts of 0.3 mm were made through the provisional to guide tooth preparation to fit

the pre-planned final outcome, not the restorative material. After removal of the provisional, it was observed that no tooth preparation was required other than to smooth irregular edges. This was achieved with a coarse disc and no anesthesia.

A customized impression coping technique⁴ was used to capture the cervical tissue contours of the implant provisional; then the final VPS impressions were taken (Figure 8). No retraction cord was necessary once no tooth had a definitive finish line. Shades were selected, and a bite registration was taken in MIP. Creating successful provisional restorations, where minimal or no preparation has occurred, can be challenging since the provisionals will lack retention form and also be thin and fragile. To fabricate the temporaries, the teeth were spot etched, bonding agent (ONE STEP [BISCO Dental Products]) was placed over the entire surface, and then the self-curing bis-acryl was injected into the putty matrix and placed over the teeth and allowed to fully cure (Figure 9). Margins were cleaned and refined with a scaler and a thin carbide finishing bur. The posterior contact points were refined with TrollFoil (TrollDental) articulating paper and verified with shimstock (Almore International). To evaluate and refine the chewing envelope, the patient sat up and chewed gum with a piece of 200- μ m articulating paper (Bausch) in place. A clear Essix retainer was made, and the patient was instructed to wear it every night to protect the provisionals. This retainer also served as a back-up in case a bis-acryl fragment broke. The patient could insert the piece back into her mouth and wear the retainer until she could come into the office for a repair.

Phase 6: Provisional Approval and Final Fabrication

The patient returned one week later to have her occlusion evaluated and to address any postoperative concerns. She reported no problems, and her speech and chewing felt normal. Adequate time is essential to ensure that patients are happy with the appearance and function of their new smiles and to make modifications, if necessary. After 4 weeks of wearing the provisional restorations, she approved the final shape and position of the teeth. Full occlusal, facial, and photo (and video) documentation of the final provisional restorations were done again to capture any changes that had occurred for communication with the lab team (Figures 10 and 11).

Phase 7: Delivery of the Final Restorations

The cementation of no-prep veneers must be performed with extreme precision and attention to detail. The veneers can be as thin as 0.2 mm, so they must be handled delicately. Any debris can interfere with the complete seating of these restorations. The patient was anesthetized, and the provisionals were carefully removed. Small tags of resin can remain on the teeth, particularly where they were spot etched, which will interfere with the final seat of the restorations if not thoroughly removed. Any areas of adhered resin were carefully removed using a sharp scaler. The teeth were microabraded with 27- μ m aluminous oxide at 40 psi (PrepStart [Zest Dental Solutions]). To avoid contamination of the teeth with any particles that would interfere with the seating process, the mouth was thoroughly rinsed, a new bib was placed, and the clinician changed to new gloves. It is critical to have a completely debris-free environment before seating the restorations. To verify fit and the margins, the restorations were tried in with a drop of water, one at a time, until all were seated.

The restorations were delivered in pairs, starting with teeth Nos. 8 and 9. At chairside, 2 restorations were prepared at a time. The internal surfaces of the restorations were cleaned using a 35% phosphoric acid gel, then silane (RelyX Ceramic Primer [3M]) was applied for 60 seconds and dried. Next, a layer of translucent shade light-cured resin cement (RelyX Veneer Cement [3M]) was applied. These treated veneers were then placed in a light-protective box. A rubber dam was placed with a split-dam technique, and TAPETRIX MATRIX (Cognident) was placed over teeth Nos. 7 and 10. Teeth Nos. 8 and 9 were treated with 35% phosphoric acid for 15 seconds, rinsed, and gently dried (not desiccated). Unfilled adhesive resin was applied with a brush, thinned with air, and light cured (Bluephase Style [Ivoclar Vivadent]). The restorations were placed on the teeth, then spot cured. Excess cement was removed with a rubber tip stimulator, and final light curing was completed. The remaining veneers were delivered in the same manner. The occlusion was refined as described earlier. An upper occlusal splint for nighttime wear was made to ensure postorthodontic retention and to protect against any possible parafunctional habits (Figures 12 to 15).

CLOSING COMMENTS

Beginning treatment with a clear vision of the desired outcome allows the multi-disciplinary team to discuss not only what can be achieved but also any risks that may be encountered in the treatment process. Often, there are challenges that the clinician cannot foresee; however, careful treatment planning and interdisciplinary communication will help eliminate, or at least limit, any complications. This patient began treatment expecting aggressive dentistry to completely change her smile but, in the end, there was little to no sacrifice of tooth structure with the aid of a comprehensive team approach.

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References

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Disclosures: Dr. Seay reports no disclosures.

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