

Aesthetic Restoration for Single-Tooth Implants *Multidisciplinary Approach*



By David P. Reichwege, DDS

Many practitioners are uncomfortable about placing single-tooth implants in the anterior area for their patients. The source of hesitancy is because of the intricacies of meeting the demanding requirements of anterior aesthetics. The surgical procedure for the placement of the implant followed by the integration of the implant are not the limiting factors for success. Instead, the overall aesthetics of the case needed to produce an excellent result has been limited by the restorative options available. In addition, other elements of anterior design aesthetics involving single-tooth replacement include shade mapping, length/width ratio, golden proportion, incisal edge position, arch form, gingival symmetry, lip line, papilla height, contact gradient, emergence profile, and occlusal relationships such as centric, anterior guidance, overjet, and overbite.

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Implant systems have advanced tremendously over the past 15 years. There are many excellent implant systems available today. The evolution of these systems has been dictated by evolution of the demands for final restorative aesthetics. In addition, there are better techniques for preparation of the implant site, with grafting techniques not only for bone but also final gingival contour and papilla management. The bone and soft tissue can be built to where the final restoration should be. Surgeons are able to place implants very precisely, and thus give the restorative doctor the ideal setting to proceed with the final phase of treatment.

However, implant abutments have been criticized for not being aesthetic. Traditional porcelain and metal crowns used to restore single-implant abutments have many aesthetic limitations. The optical effects of light with porcelain and metal frequently cause a compromise in even the most detailed shade mapping. Also, the passage of light through gingival tissue at the margin can cause a darkening effect, resulting in patient dissatisfaction and



Figure 1. The patient was unhappy with the aesthetics of teeth Nos. 7 and 10.



Figure 2. The insert for the implant replacing tooth No. 7 was not seated completely. Also, a periapical lesion was suspected on tooth No. 7.



Figure 3. A new implant insert was placed, and proper seating was confirmed.



Figure 4. The provisional restorations for teeth Nos. 7 and 10 were cemented in place.

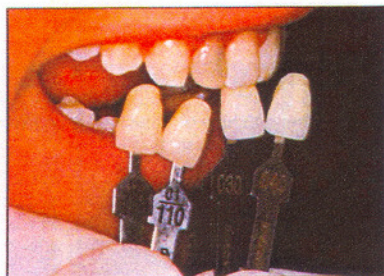


Figure 5. Photos with shade tabs were sent to the laboratory.

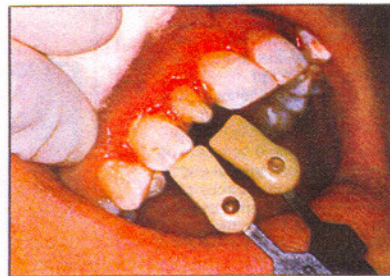


Figure 6. Cervical and body shades were matched with the appropriate shade tabs/guide.



Figure 7. Final restorations on teeth Nos. 7 and 10.

case failure even with the best-placed implant and restoration. In many cases matching shades of porcelain and metal crowns to adjacent natural teeth is not only difficult but also sometimes impossible.

The following case study involves all the restorative challenges described, and involves a multidisciplinary approach to treatment involving oral surgery, orthodontics, endodontics, and anterior restorative principles for aesthetics as taught at the Las Vegas Institute and the Pacific Aesthetic Continuum.

CASE HISTORY

A 16-year-old female presented with a desire to improve her smile. She felt her smile was unattractive because of the size, shape, and color of teeth Nos. 7 and 10. She stated that she was unhappy with these teeth to the degree that she no longer smiled. Porcelain and metal crowns had been placed on these teeth the year before, and the results were not acceptable to her.

We conducted a complete clinical and diagnostic evaluation which included 35-mm photos, diagnostic models, radiographs, diagnostic wax-up provisional restorations, smile evaluation forms, shade mapping, and 35-mm photos with shade tabs. Her medical history was negative. Periodontally her bone level and gingival tissue were in excellent health. Her home care was also excellent. Tooth No. 7 was a peg lateral and tooth No. 10 was congenitally missing, and an implant had been placed the previous year. She had finished orthodontics, and porcelain-metal crowns were placed on teeth Nos. 7 and 10. Her concern was the aesthetics of these crowns in terms of size, shape, and shade. The porcelain was bluish-gray compared with adjacent teeth. She felt they lacked the contour of normal teeth. The length/width ratio of tooth No. 7 was 97.2% with a width of 7 mm and length of 7.2 mm. The length/width ratio of tooth No. 10 was 100% with length and width of 7.3 mm. Because the length/width ratio of teeth Nos. 8

and 9 was 79% with width of 7.9 mm and length of 10 mm, teeth Nos. 7 and 10 resembled small central incisors (Figure 1). Radiographically, it was noted that the insert for the implant was not seated completely. Also, a periapical lesion was suspected at the apex of tooth No. 7 (Figure 2).

TREATMENT PLAN

At the consultation appointment, we again reviewed the patient's concerns, the etiology behind these concerns, and the treatment necessary to achieve the desired corrections and obtain the desired aesthetic goal. The conditions to be addressed were:

- (1) Correcting the length/width ratio of teeth Nos. 7 and 10.
- (2) Finding an all-ceramic

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restoration that would be appropriate for implants as well as natural teeth, and incorporating all the aesthetic advantages of all-ceramic versus porcelain-metal.

- (3) Idealizing the line angles and incisal edge contours.
- (4) Forming the correct emergence profile, arch form, and axial inclinations, and having the curvature of the lower lip follow the curve of the incisal edges of the maxillary teeth.

(5) Achieving proper gingival symmetry and soft tissue height with teeth Nos. 6 through 11.

(6) Achieving proper interproximal papilla height.

(7) Using shade mapping to harmonize with adjacent teeth.

(8) Orthodontically reducing the mesial-distal dimension of the space for teeth Nos. 7 and 10.

(9) Replacing the partially seated implant insert for tooth No. 10.

(10) Endodontically treating tooth No. 7.

The laboratory we selected to fabricate the ideal wax-up, provisional restorations, and final ceramic crowns was Sunrise Dental Laboratory in Las Vegas, Nevada. Mike Milne, the owner, works closely with the Las Vegas Institute and is very experienced in communicating the elements of smile design. The final wax-up he made simulated the finished restorations and was used as a template for provisionals that would be worn during orthodontic space closure.

TREATMENT

Dr. David Bojrab of Fort Wayne, Indiana performed the surgical placement of the implant the previous year. Implant placement is critical for later aesthetic restorations. The mesial-distal position, apical-coronal position, buccal-lingual position, and angulation determined this placement. Also, a 3-mm sulcus depth is required to provide the subgingival dimension for the restoration. The buccal edge of the implant platform was about 1 mm lingual to the free gingival margin to give adequate tissue support. The selection of implant diameter was based on the diameter of the root of the tooth at that level. Also, the platform of the implant compared very closely with the dimensions of the natural root in order to provide predictable soft tissue support. Osseointegration as well as the position of the implant were excellent.

Dr. Todd Mabry of Fort Wayne, Indiana performed endodontic therapy on tooth No. 7. Tooth No. 7 was a peg lateral with a small clinical crown and under-developed root form. The canal space was difficult to demonstrate radiographically. In addition, there was evidence of a periapical lesion. Alternatives to endodontics were discussed with the patient. This included removing the tooth and later placing either a fixed

bridge or an implant. It was decided that preserving natural tooth structure should be our goal, and that our treatment options be as conservative as possible.

Dr. Aron Dellinger of Fort Wayne, Indiana performed the orthodontics in the case. The goals that he accomplished finalized the midline, ensured horizontal and vertical alignment, placed the root of tooth No. 7 and the implant for tooth No. 10 centrally in the space, and reduced the mesial-distal dimensions for teeth Nos. 7 and 10 to 5.9 to 6.1 mm. After these goals were met, retainers were made to maintain the space for the 3 to 4 weeks during which the final restorations were made. Also, retainers were made after final cementation to prevent spaces from reopening.

The process of fabricating the final restorations, which Sunrise Laboratory created, was unique not only in method but materials. The ceramic for the crowns was IPS Empress (Ivoclar Vivadent). However, a vectris coping was made for tooth No. 10, opaqued to mask the metal of the implant, and bonded inside the crown. The crown and coping were to be delivered as one piece and cemented with glass ionomer cement. Because the provisional restorations were to be worn 6 to 8 months, they were also fabricated at the lab with processed acrylic for proper size, contour, strength, and marginal fit.

After administration of topical and local anesthetic and placement of a rubber dam, the porcelain and metal crowns for Nos. 7 and 10 were removed using a diamond 5850-U16 (Brasseler USA) and carbide H34-012 (Brasseler USA) with copious water irrigation. The partially seated insert for the implant was removed. A new insert LA3/4 (Paragon) was placed, and a film was taken to confirm that it fully seated in the implant (Figure 3). This was contoured to have 2.5-mm clearance with the opposing teeth, and torqued into place using 30N/cm.

A post preparation was made for tooth No. 7 and a Luscent anchor (Dentatus)

was bonded into place with Variolink (Ivoclar Vivadent). The canal space was etched with 30% phosphoric acid, washed, and primed with Excite Primer (Ivoclar Vivadent). Variolink was placed in the canal and the Lucite post was light cured for 1 minute. Heliomolar tooth No. 7 was cemented with Temp Bond Clear (Kerr) (Figure 4). The occlusion was checked in centric and lateral excursions, and an appointment to begin orthodontic space closure was made. This orthodontic correction lasted approximately 8 months, and achieved the desired goals as described previously. The final restorations for teeth Nos. 7 and 10 could now be 6 mm wide and 8 mm long.

Final shade mapping was accomplished with the appropriate shade tabs and photographed with a 35-mm camera. The photos were sent to the lab with shade tabs (Chromascop, Ivoclar Vivadent) (Figure 5). After topical and local anesthetic, the provisional restorations were removed, and the gingival tissue architecture was refined with a diode laser. Upper and lower full-arch impressions were taken using a vinyl polysiloxane light- and heavy-body impression material (Examix, GC America). The cervical and body shades were matched with the appropriate shade tab guide (Figure 6). A stick bite registration was recorded with Blu-Mousse fast set (Parkell), and the provisional restorations were replaced. The written prescription, maxillary and mandibular full-arch impressions, shade mapping, pre-operative study models, diagnostic wax-up, 35-mm photos (full-face, natural smile, and close-up) were sent to Sunrise Laboratory.

The restorations were returned from the laboratory and tried on the dies and refractory models to evaluate fit and contour. The restorations were moistened and checked against the shade guide. The patient was anesthetized, the provisionals removed, and the preparations cleaned with the ICB brush (Ultradent) to remove debris. The marginal fit and aesthetics of the restorations

were evaluated. The opaque vectris coping for tooth No. 10 had very successfully masked the implant metal. The teeth were isolated with a rubber dam, and the restoration was cemented with ProTec Cem (Ivoclar Vivadent). The crown for tooth No. 7 was etched for 1 minute with phosphoric acid (Ultratech, Ultradent), rinsed, and dried. The ceramic primer (RelyX, 3M ESPE) was placed for 1 minute and air dried. The preparation for tooth No. 7 was rinsed with Concepsis for 30 seconds, etched with 30% phosphoric acid for 15 seconds, rinsed, and excess water was removed with suction, leaving a moist surface. Excite primer (Ivoclar Vivadent) was applied, dried, and light cured for 20 seconds. Visual inspection revealed a glossy surface, indicating the formation of the desired hybrid layer of dentin. Variolink, shade translucent, was placed inside the crown, which was seated, and excess was removed with Benda Brush (Centrix) and a rubber tip, and spot tacked with a curing light at the cervical for 5 seconds. The contacts were cleaned with floss, Deox (Ultradent) was placed around the margin, and final cure was done for 40 seconds on each side. The rubber dam was removed, and the occlusion checked in centric and lateral excursions. Gingival margins were finished with the 134 EF finishing dia-

mond, and final polish was with Dialite tips (Brasseler USA) (Figure 7).

CONCLUSION

The vitality and aesthetics of all-ceramic restorations allow clinicians to successfully create a natural appearance in order to harmonize with adjacent teeth. These all-ceramic systems also give clinicians a wide range of choices and treatment opportunities in aesthetic dentistry when faced with multidisciplinary treatment plans. This article shows a reliable alternative for using opaque copings to hide the metal of implants and to be able to take advantage of the aesthetics of the all-ceramic restorations. †

Dr. Reichwage has practiced family dentistry in Fort Wayne, Ind for 29 years. During the past 5 years he has completed post-graduate courses in laser dentistry, and advanced cosmetic, periodontal, and restorative dentistry through the Pacific Aesthetic Continuum, the Las Vegas Institute for Advanced Dental Studies, the J.P. Consultants Institute, and the Academy of Laser Dentistry. Professional memberships include the Academy of Operative Dentistry, Academy of Laser Dentistry, American Dental Association, Indiana Dental Association, and Isaac Knapp District Dental Society. He has served organized dentistry on both state and local levels, and is past president of the Isaac Knapp District.