The Esthetic Challenge of Treating a Single Central Incisor

Rita Antonini Tempel, DDS

Abstract

Creating a beautiful provisional is essential to the success of a final single indirect restoration since the patient, dentist, and laboratory technician use the provisional as a guide for the final restoration. This article highlights the importance of collaboration between the clinician and laboratory technician both prior to and during treatment to minimize chair time and ensure the final restoration's success.

Key Words: crown, laser gingivectomy, emergence profile, diagnostic wax-up, provisionalization, Case Type II

> When treating a single central incisor with an indirect restoration, it is critical that the restorative dentist and laboratory technician have a shared vision of the criteria for esthetic excellence.

Introduction

The successful restoration of a single central incisor is considered one of the most challenging dental procedures. Symmetrical length, width, contours, line angles, axial inclination, emergence profiles, incisal embrasures, surface texture, and shade selection all play a critical role in the final restoration. The treatment-planning phase includes evaluation of photographs, study models, provisionalization, and restorative material selection. When treating a single central incisor with an indirect restoration, it is critical that the restorative dentist and laboratory technician have a shared vision of the criteria for esthetic excellence.[1]

Case Presentation

Patient's Chief Complaint and History

A 55-year-old female wanted an esthetic crown for tooth #8, which had been fractured in a fall, exposing the pulp. Her general dentist had placed an immediate five-surface resin bonding on the tooth. Six weeks later the patient was referred to an endodontist for root canal therapy. The patient was unhappy with the esthetics of the resin bonding and asked the endodontist for a referral to a dentist who could provide an excellent esthetic result. The patient said that she typically loved to smile but found herself hiding her smile ever since the "yellow and long" bonding was placed **(Fig 1)**.

Evaluation, Diagnosis, and Treatment Plan

Evaluation of this case involved examining radiographs, perio charting with mobility readings, temporomandibular joint (TMJ) exam, occlusion evaluation, the AACD Accreditation photographic series,[2] diagnostic casts, and a master diagnostic model (MDM), or soft tissue/hard tissue model.[3] The clinical exam revealed a Class I right and left molar and canine relationship. The perio charting was within normal limits with Grade 1 mobility on #7-#9. The TMJ was within normal limits and the patient had no joint noise or deviations. The clinical exam, photographs, and study models revealed gingival height discrepancy at #8 and #9. There also was asymmetry in size, length, shape, contours, axial inclination, line angles, surface texture **(Fig 2)**, and emergence profiles **(Fig 3)**, as well as an overall shade and value mismatch.

Tooth #8 had been endodontically treated post-trauma with an unesthetic resin bonding. The restoration displayed overall undesirable size and contours as compared to the adjacent #9. The asymmetrical gingival height also contributed to the discrepancy between #8 and #9.

The treatment plan consisted of an MDM (Valley Dental Arts; Stillwater, MN), laser gingivectomy at #8, and post and core. The provisionalization helped guide soft tissue healing and enabled the patient to approve the macro and pink esthetics prior to proceeding with the final crown.

Figure 1: Preoperative smile, frontal view (1:2), displaying unattractive resin bonding on #8.

Figure 2: Preoperative retracted view (1:1), showing the asymmetry between #8 and #9 caused by the discolored and irregularly shaped restoration on #8.

Figure 3: Preoperative occlusal view (1:2), showing the lack of symmetry in the emergence profile of #8 compared to #9.

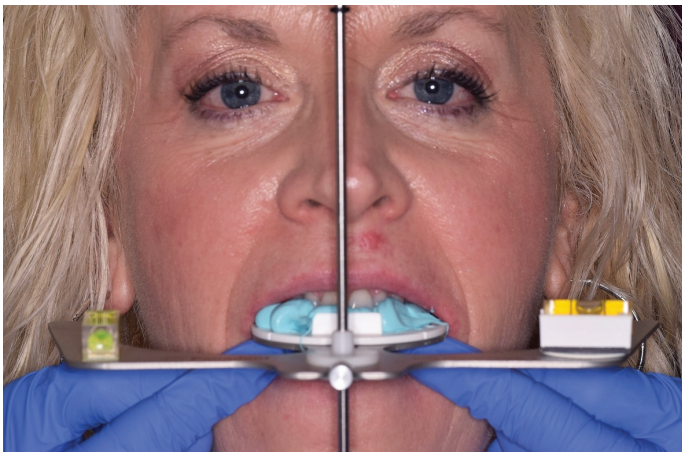

Figure 4: A dento-facial analyzer helps to transfer the patient's occlusal plane, midline, and cants in the patient's plane of occlusion.

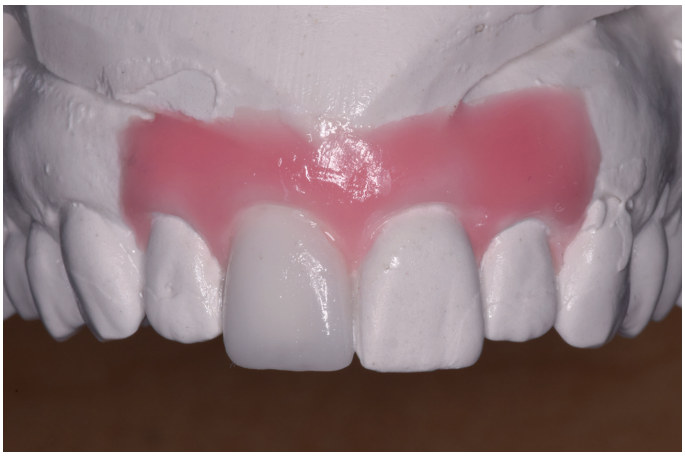

Figure 5: The MDM is a very useful diagnostic and treatment-planning device for communication among the laboratory technician, the patient, and the restorative dentist.

Treatment

Preoperative: A polyvinyl siloxane (PVS) impression (Aquasil Monophase, Dentsply Caulk; Milfred, DE) was made of the maxillary arch, an alginate substitute impression (Algin•X Ultra Alginate Alternative, Dentsply Caulk) was made of the opposing arch, and a Kois dento-facial analyzer (Panadent; Colton, CA) **(Fig 4)** was used to order the MDM.

The lab prescription, along with impression records and the AACD Accreditation photo series, was sent to the dental laboratory for fabrication of the MDM **(Fig 5)** with instructions to create #8 in symmetry and harmony with the adjacent tooth #9.

The MDM was received and approved by the patient and the dentist. The first treatment appointment involved a laser gingivectomy utilizing a vacuum-formed stent (vacuum-forming machine, T&S Dental & Plastics; Myerstown, PA) made from the MDM to guide the desired gingival height position on #8 to mirror the gingival height of #9. The patient was anesthetized with topical anesthetic (Ultracare 20% benzocaine gel, Ultradent; South Jordan, UT) and buccal infiltration with 1 carpule 2% lidocaine with 1:100,000 epinephrine. The vacuum-formed stent was placed on the maxillary anterior segment as a template to recontour the facial gingiva to the new desired gingival height. A perio probe (PQW6, Hu-Friedy; Chicago, IL) was used to sound bone as well as measure sulcus depth to confirm the biologic width would not be compromised and the laser gingivectomy was appropriate for this case. The perio probe was also used to create bleeding points marking the limit of the gingivectomy. The patient, doctor, and assistant wore laser protection eyewear. The laser gingivectomy was performed with a soft tissue diode laser (SiroLaser, Dentsply Sirona; York, PA) while the assistant used copious water irrigation and a high-speed suction to reduce laser plume.[4]

Tooth preparation: A post space was created on #8 to allow for a post and core buildup. The canal was treated with an equal mix of Xeno IV self-etching dental adhesive and Self-Cure Activator (Dentsply Caulk). A gentle stream of air was applied to evaporate the solvent until there was no flow of adhesive. The treated surfaces were light-cured (Valo, Ultradent) for 10 seconds. The fiber post (ParaPost Fiber Lux, Coltene/Whaledent; Alstatten, Switzerland) was silanated (Bis-Silane A + B, Bisco; Schaumburg, IL) and placed into the canal with white buildup material (FluoroCore, Dentsply Caulk). The buildup was light-cured and #8 was prepared with diamond burs (5858.014, 5379.023, and LVS3 016, Brasseler USA; Savannah, GA) for an IPS Empress Esthetic crown (Ivoclar Vivadent; Amherst, NY).[5]

Provisionalization: A provisional crown was made by filling the putty matrix of the diagnostic wax-up with provisional bisacryl (Luxatemp Ultra shade B1, DMG America; Englewood, NJ). The provisional was trimmed (Sof-Lex XT coarse discs, 3M ESPE; St. Paul, MN) and glazed (Palaseal, Kulzer; South Bend, IN), and cemented with clear temporary cement (Tempbond Clear with Triclosan, Kerr; Orange, CA). The patient was asked to wear the provisional for six weeks to allow soft tissue healing and to "test" the provisional's length, shape, and contours. She was instructed to rinse with 0.12% chlorhexidine gluconate (Peridex, 3M ESPE) twice a day for 60 seconds for 3 consecutive days. On the fourth day, the patient was advised to submerge a sulcus brush into a small amount of Peridex and gently brush along the gingiva/provisional crown margin in the mornings and evenings until the next appointment.

Postoperative appointments: The patient returned three weeks later for the first postoperative appointment. Both she and the dentist were pleased with the healing and the position of the new gingival zenith of #8. The patient was also pleased

with the appearance of the provisional. At the six-week postoperative appointment, photographs and impressions of both the provisional crown **(Fig 6)** and the preparation were made. These were necessary to evaluate areas for improvement and to communicate with the laboratory technician.

Modifications: Even though the patient accepted the provisional crown, the dentist and lab technician were able to identify areas in need of improvement through analyzing the photographs and an impression of the actual provisional restoration. The four specific areas requiring modifications were as follows:

- The mesial line angle of #8 did not mirror #9 and needed adjustments so that the reflection of light on #8's mesiobuccal (MB) line angle matched the MB line angle of #9.
- The height of contour at the gingival third of the provisional crown was more coronal than the position of #9.
- The mesioincisal embrasure was not identical to #9.
- The distobuccal line angle and width of #8 were not symmetric with #9.

All four areas were addressed and improved upon in the final restoration.

Shade and material selection: Shade selection was done at the beginning of the appointment before the teeth became dehydrated, to avoid affecting the value. The provisional crown was removed and the preparation shades and final crown shades were selected. The preparation shades were photographed with tab ND2 (Natural Die Material, Ivoclar Vivadent) near the gingival margin and the higher value shade ND1 located at the coronal extent of the preparation **(Fig 7)**. Because the preparation had a nice gradual transition from ND2 to ND1, it was important to convey the subtle gingival warmth with a higher value toward the incisal third in the final restoration. Final shade selection was accomplished by using multiple shade tabs from different angles to show the ceramist the different areas of shading.

On the lab prescription, Vita 3D 1M1 was selected as the body shade, with higher value toward the incisal. It is helpful to take shade photographs while the patient is supine and to capture the photos from above their head. It is best to take shades without light reflection that could interfere with the value or final shade selection **(Fig 8)**. A double-cord technique was used for the final impression. Two 00 cords (Ultrapak, Ultradent) were gently placed into the sulcus and allowed to remain for a couple of minutes. The final impression was made with light body (Aquasil Ultra XLV) and heavy body (Aquasil Ultra Heavy) PVS using a custom tray. A Kois facebow was taken and the removable index was sent so that the lab could mount the prepared model on a Panadent articulator. The provisional crown #8 was recemented with Tempbond Clear with Triclosan and the patient was dismissed. The clinical photos were e-mailed to the laboratory technician. The final PVS impression of #8 and the provisional impression also were sent to the lab.

It is very important to involve the ceramist in the final material selection. In this case, the dentist and the ceramist independently spent a great deal of time evaluating the photographs and the model to prepare for a live discussion, during which they conferred about the changes desired from the provisional crown to the final

Figure 6: The creation of a provisional crown that foreshadows the anatomy and position of the final restoration is crucial to success.

Figure 7: The selection of tooth preparation shades allows the laboratory to create a restoration that blends properly intraorally.

Figure 8: Photographing shade tabs from above while the patient is supine helps to avoid light reflection or glare.

Figure 9: Preoperative right lateral retracted view (1:1), showing the lack of light reflection and surface anatomy on resin restoration #8.

Figure 10: Postoperative right lateral retracted view (1:1), demonstrating the surface texture and anatomy with the light reflection.

crown as well as about a material that would meet expectations and work well in the ceramist's hands. Together they decided on Empress Esthetic Ingot ETC1, cut back and layered with Empress Porcelain. This pressable restorative material was chosen for its translucency.[6]

Delivery and cementation: When restoring a single-unit anterior crown, it is best to remind patients that when the restoration is tried in it may be necessary to return the crown for modifications. As it turned out, there was no need for additional adjustments in this case since the patient was pleased with the restoration and refused any modification of the crown.

No anesthetic was used to try in or cement the restoration. The provisional was removed, the preparation was cleaned with piezo (Suprasson Newtron P5 scaler, Satelec Acteon; La Ciotat, France) and flour pumice (Preppies, Whip Mix; Louisville, KY), and 00 cord was placed to control moisture contamination. The Empress crown #8 was tried in with translucent try-in paste (Variolink II, Ivoclar Vivadent). Photographs taken during the try-in stage are helpful for final approval. For example, the before and after right lateral views of #8 **(Figs 9 & 10)** demonstrate the ceramist's ability to work with the material so that the final crown has the same surface anatomy and texture as the adjacent teeth.

The patient approved the crown's esthetics and desired final cementation at this appointment. The intaglio surface of the crown was rinsed with water, treated for 20 seconds with Ivoclean (Ivoclar Vivadent), and rinsed again. The crown was air-dried and Monobond Silane (Ivoclar Vivadent) was placed on the intaglio surface. The tooth preparation was treated with etchant and Excite F DSC Bonding Agent (Ivoclar Vivadent), air-dried, and light-cured. Variolink II Dual Cure resin cement translucent base and catalyst was mixed. The crown was cemented and excess cement removed, then it was light-cured, and oxygen-inhibiting glycerin gel (Liquid Strip, Ivoclar Vivadent) was applied at the margins with a final light-curing. The patient returned two weeks later for the final AACD photographic series **(Figs 11-15)**.

> Symmetrical length, width, contours, line angles, axial inclination, emergence profiles, incisal embrasures, surface texture, and shade selection all play a critical role in the final restoration.

Figure 11: Postoperative smile view (1:2), displaying a restoration that matches the adjacent tooth and looks natural.

Figure 12: Postoperative occlusal view (1:2), showing how the correct anatomy of #8 blends well with the adjacent #9.

Figure 13: Postoperative retracted view (1:1), showing improved matching gingival margins, esthetic contours, and symmetrical incisal embrasures.

Figure 14: Postoperative retracted view of #8 shows symmetrical incisal lengths, shade, and mesiobuccal line angle contours.

Figure 15: Postoperative portrait of a very happy patient.

Summary

The restoration of a single central incisor can be one of the most difficult procedures in dentistry since even the slightest variations in contour, color, and light reflection will be noticed.[7] The dentist and the laboratory technician must share excellent esthetic criteria to ensure the successful delivery of a single central indirect ceramic restoration. Communication through photographs and models and live discussion improve the chances of a successful delivery in a single visit. To deliver an outstanding result and to prevent the need for numerous appointments and remakes, there must be an exceptional collaboration between the dentist and the lab technician.

Acknowledgment

The author thanks Jenny Wohlberg, MDT, AAACD (Valley Dental Arts; Stillwater, MN), for her ceramic artistry on this case.

Dr. Tempel owns a private practice in Gettysburg, Pennsylvania.

Disclosure: The author did not report any disclosures.

References

1. American Academy of Cosmetic Dentistry (AACD). A guide to Accreditation criteria. Madison (WI): AACD; 2014.
2. American Academy of Cosmetic Dentistry (AACD). Photographic documentation and evaluation in cosmetic dentistry: a guide to Accreditation photography. Madison (WI): AACD; 2015.
3. Terry DA, Karl F, Leinfelder, Geller W. Aesthetic and restorative dentistry: material selection and technique. Stillwater (MN): Everest Publishing Media; 2009.
4. Terry DA, Geller W. Esthetic and restorative dentistry: material selection and technique. 2nd ed. Hanover Park (IL): Quintessence Pub.; 2013.
5. Gupta A, Jain N, Makhija PG. Clinical applications of 980 nm diode laser for soft tissue procedures in prosthetic restorative dentistry. J Lasers Med Sci. 2012 Jan;3(4):185-8.
6. Ivoclar Vivadent. IPS Empress Esthetic. Schaan (Liechtenstein): 2018. Available from: http://www.ivoclarvivadent.com/en/p/all/products/all-ceramics/ips-empress-system-technicians/ips-empress-esthetic
7. Peyton JH. A conservative treatment for restoring incisal edge wear: how pre-restorative data collection helps in Case Type II. J Cosmetic Dent. 2015 Winter;30(4):25. **jCD**

> It is very important to involve the ceramist in the final material selection.