

Treating a Fracture Using Direct Resin

Accreditation Clinical Case Report, Case Type IV (Class IV Fracture)

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Figures 1a & 1b: Preoperative smile; fractured left central incisor resulting from a traumatic incident. Postoperative smile; restored left central incisor mimicking the color and translucency of the right central incisor.

Introduction

Class IV composite bonded restorations can be one of the most challenging clinical procedures for dentists. The focus is on recreating the missing segments of tooth structure with a resin material directly in the patient's mouth in a way that harmonizes with the balance of the smile. In this endeavor, the dentist becomes the operating clinician as well as an artist in the attempt to invisibly replicate the shade as the resin is layered with a stratification technique mimicking the translucency, value, texture, form, and function.¹

Our mission is to provide the patient with a restoration that is predictable and durable, and that supports health. Often the demand for this application is spontaneous, resulting from a traumatic injury.² The clinician is called upon to perform his or her magic to replace the damaged or broken segments of the individual's smile during an emotionally charged time. The options available in contemporary dental materials are exceptional and the clinician has the opportunity to combine and layer composite resins to blend shades producing natural, lifelike results. Dentists can also be aided by computer spectrophotometers to provide additional objective data in shade selection. Ultimately, through the use of deliberate technique and artistry, the clinician has the potential to erase the disfiguring damage with a restoration that is undetectable.

Patient History

The patient was a 29-year-old-female with no adverse medical history and in good overall health. She presented on an emergency basis after being involved in an incident that resulted in the fracture of tooth #9 (**Figs 1a & 1b**). Her chief complaint was that she needed to have her broken front tooth fixed immediately; the owner of a com-



Figures 2a & 2b: Preoperative 1:2 view; visible horizontal fractured left central incisor. Postoperative 1:2 view; restored left central incisor matching the light reflective properties of #8.

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pany that deals with building plans and development for the city of Los Angeles, she knew that she could not meet with clients in this condition.

Findings

An emergency examination was performed, and health history, diagnostic models, inter-occlusal registration, digital radiographs, and digital photographs were recorded.³ The patient's symptoms were fully reviewed and evaluated and all treatment options were discussed with her. The patient was also informed of the possibility of the need for endodontic management of the traumatized tooth, as well as the potential for discoloration of the remaining tooth structure. All the patient's questions were answered. The teeth were evaluated and checked for any possible fractures, pulp exposures, and mobility. A single visible fracture was observed progressing from the mesial one-third to the incisal one-half (Figs 2a & 2b). The balance of her anterior teeth appeared

to be structurally sound. The patient had experienced no spontaneous pain since the accident. Tooth #9 responded to cold, was negative to percussion, and did not exhibit mobility.

Her temporomandibular joint was asymptomatic and she reported no abnormal discomfort from the trauma. The radiographic findings were also within normal limits.

The following esthetic and restorative issues were discussed:

1. Shade: home bleaching prior to final restorative treatment was recommended.
2. Restorative options:
 - a. porcelain versus direct bonding⁴
 - b. functional issues
 - c. longevity of material choices
 - d. possible need for endodontic management and discoloration of the residual tooth structure and root.
3. Recare and maintenance: observation, management and evaluation.

Diagnosis and Treatment Planning

After treatment options were discussed, the patient selected a direct composite resin restoration. Tooth #9 was provisionally restored for an observation period to determine if, over the next few weeks, any symptoms developed and to complete a home whitening regime using 10% Opalescence (Ultradent; South Jordan, UT) to achieve the esthetic color that the patient desired in the final restoration. A diagnostic wax-up was completed to develop the intended final contours of tooth #9. From these diagnostic models, a matrix was fabricated to aid in the creation of the final restoration. A tray technique was utilized to whiten the patient's smile. The patient was then instructed to discontinue whitening for three weeks prior to the initiation of the definitive resin restoration. A Crystaleye Spectrophotometer (Olympus America; Center Valley, PA) was used to aid in the objective measurement of the shade



Figure 3: A Crystaleye Spectrophotometer was used to digitally color map the right central incisor. The information was transferred to computer software, analyzed, and used to assist in selecting composite materials with the correct color and translucency.



Figures 4a-4c: Diagnostic wax-up showing the proposed treatment plan (putty matrices for the definitive composite additions to the lingual and facial contours).



Figures 5a & 5b: A Crystaleye Spectrophotometer analysis on #8 showing the color mapping to be matched. An analysis was also done on #9 to compare it to #8.

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of the adjacent teeth (Fig 3). This provided valuable information in the selection of composite shades for the final direct resin. Further evaluation and vitality tests were done to ensure that the tooth did not require endodontic therapy.

Two sets of silicone putty matrixes using Splash Putty (Discus Dental; Culver City, CA) were created from the diagnostic wax-up⁵ (Figs 4a-4c): one to replicate the intended lingual contours and the incisal edge for the first layer of hybrid composite, and the other as a guide for the facial portion of the tooth to help reproduce #8.⁶ A Crystaleye Spectrophotometer reading was taken on both #8 and #9 (Figs 5a & 5b) to help determine the appropriate shade of the final composite resin. A color mock-up was done in the patient's mouth to verify the composite "recipe" that would best mimic the colors of the adjacent intact central.⁷ Renamel (Cosmedent; Chicago, IL) shades incisal light A1 and B1 were selected.

Treatment

After anesthetizing the patient, the provisional composite was removed from #9 and the tooth was prepared for final restoration. A long facial bevel was used to help blend the composite into the existing dentition. Tooth #9 was etched with phosphoric acid for 15-20 seconds, then Single Bond (3M ESPE; St. Paul, MN) bonding agent was placed and light-cured for 20 seconds. A putty matrix was brushed with wetting resin (Ultradent) to prevent the composite from adhering to the putty. Incisal light hybrid composite (Cosmedent) was then placed in the matrix to create the lingual shell of resin and positioned on the teeth. A hybrid composite was chosen due to the higher strength of the material; this would provide a guide for the incisal edge length and shape of #9. A1 and B1 microfill composites (Cosmedent) were selected as the body layer of the composite. These were placed through the body of the tooth and mamelons were formed under the final layer of composite to give the tooth a natural appearance. Incisal light microfill was then placed at the incisal one-third to create the final layer of translucency. Tooth #8 exhibited defined lobular areas of translucency in the incisal region that needed to be mirrored in #9. A microfill composite was chosen for the surface of the restoration because of the ease with which it can be polished and retain the polish. The composite was then taken to final



Figures 6a & 6b: Preoperative and postoperative 1:1 frontal images showing the esthetic result of the composite placement, finishing, and similar light-reflective properties.



Figures 7a & 7b: Preoperative and postoperative full-face images, showing the final case after bleaching and direct Class IV resin placed.

contour, defining the mesial line angle, light-reflective properties, and contour. A pencil mark was placed on the mesial facial of the tooth to help visualize the height of contour of the mesial-facial line angle.⁸ Coarse and medium-grit FlexiDiscs (Cosmedent) and an ET9 bur (Brasseler USA; Savannah, GA) were then used to achieve final contour. No tints or opaquers were needed to achieve the best possible esthetics in this case.

The restoration was then taken to final finish and polish with FlexiPoints,

FlexiCups, FlexiBuffs, and Enamelize (Cosmedent) (Figs 6a & 6b).⁹ Occlusion was adjusted and postoperative instructions—including oral hygiene directions—were given to the patient. A two-week postoperative appointment was made to check tissue health. Final digital photographs were taken several weeks after the final restoration was placed (Figs 7a & 7b).

SUMMARY

Direct resins are a challenging application and require the dentist to raise their level of artistic ability. When used properly, composite resin material can mimic optical properties and allow the restoration to disappear into the surrounding dentition. The restoration can remain conservative, only augmenting the lost tooth structure, which is an enormous benefit to the patient. Direct resins are an invaluable, conservative,

and durable treatment option for all patients.¹⁰

Acknowledgments

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Dr. Crispin graduated from Tufts School of Dental Medicine in 2003. She teaches at Esthetic Professionals, a private education center in Tarzana, California.

Disclosure: In her capacity as associate director of Esthetic Professionals, Dr. Crispin receives product support from numerous manufacturers, including Olympus, Discus Dental, Cosmedent, 3M ESPE, and Brasseler USA.

Examiners' Observations

Restoring a Tooth to Natural Form and Function

James H. Peyton, DDS, FAACD

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Case Type IV tests the dentist's clinical skill in creating an artistic and natural-looking restoration. There is no laboratory involved, so the clinician has complete control of the situation. The candidate has the choice between a Class IV fracture and a diastema closure. Case Type IV is the most conservative of all the restorations that are required for Accreditation. The AACD promotes conservative dentistry and these restorations perfectly demonstrate that standard. The procedure can be performed in a single visit, with some "touch-ups" and final photographs at a later date. There is also the advantage that the restorations can be modified, contoured, or redone without the additional expense of using a laboratory. In this case, a Class IV mesial-incisal fracture repair was performed on tooth #9. Dr. Kristi Crispin did a very nice job in restoring the tooth to natural form and function.

As an examiner, one of the major factors to evaluate is whether the restoration "stands out" in the 2:1 postoperative photographs. In other words, the best restoration is one that you can't see! In this case the restoration blends nicely into the tooth, as shown in the 2:1 postoperative view.

Five examiners grade each case. A passing grade is given when the total score is -7 or less. A case passes when three or more examiners give the case a passing grade. All five examiners passed Dr. Crispin's case.

The following is a summary of the examiners' comments:

- Criterion #42: **Is the labial anatomy (primary, secondary, and tertiary) appropriate? Are there three planes for the labial contour of the central incisor?** The labial anatomy was a little under-contoured, secondary anatomy of depression between mesial and central lobe in different spot than contralateral tooth.
- Criterion #56: **Is incisal translucency and halo effect appropriate?** The incisal translucency and halo effect were inappropriate.
- Criterion #61: **Is margin placement and design appropriate? Are the margins visible?** The margin placement and marginal design were inappropriate, the margins were visible.
- Criterion #86: **Is the cervical/incisal tooth length symmetrical from right to left?** The mesial-incisal edge was slightly short.

This Class IV fracture was an excellent case selection. A single anterior tooth was fractured, the tooth was fairly monochromatic, and the teeth had excellent gingival health. This created a very straightforward case, which Dr. Crispin handled well. There are no extra points awarded for selecting a complex case. Any tooth that is treated will be graded. Examiners are looking for a high level of excellence, not perfection. There were some minor faults noted: the incisal edge being slightly short on #9, a slight depression on the labial anatomy, and a lack of incisal translucency. Fortunately, the adjacent teeth had very little incisal translucency, so this was not a major factor. The other faults were judged to be minor and the case passed easily. This case demonstrated that Dr. Crispin created an excellent restoration worthy of Accreditation. **jCD**



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