

Preserving Natural Tooth Structure with Composite Resin

Prashant Hatkar, BDS, MDS

Accreditation Clinical Case Report, Case Type V: Six or More Direct Resin Veneers

AACD Accreditation recognizes excellence in cosmetic dentistry. To obtain Accreditation, one must pass a written examination, submit clinical cases, and pass an oral examination. Cases encompass a broad range of treatment. Each case requires pre- and postoperative images and a written report. To pass, cases must meet standards set by the American Board of Cosmetic Dentistry. This section's objective is to support your goal of becoming Accredited.

Introduction

Scientific and technological advances in restorative materials and adhesive technology continue to enhance the practice of dentistry. Selecting the correct treatment option, based on patient age and functional requirements, will determine which treatment modality will be successful. Conserving tooth structure in young patients is paramount; therefore, the best treatment alternative to fulfill their restorative and esthetic needs usually is composite resin bonding.

Patient History

The patient was a 22-year-old male with no relevant medical history. His overall health was excellent, but he was very unhappy with the “unsightly” appearance of his smile. He had a history of substandard composite restorations, which included direct resin veneers placed on his front teeth by his previous dentist several years earlier. His chief complaint was that his front teeth appeared discolored, with irregular and rough surfaces. He desired whiter teeth and a new smile to “kick start” his professional career after graduation from college.

This treatment modality was chosen because the patient was young and there was more than enough enamel remaining for excellent bonding.

Clinical Findings

The patient received a comprehensive examination and a full-mouth series of radiographs. The occlusal relationship of his teeth was Class I, with normal overjet and overbite with mild occlusal and incisal wear. His temporomandibular joints were asymptomatic, with no audible sounds and a normal range of motion. The patient's periodontal health was good, with no pocketing and no tooth mobility. There was mild marginal gingivitis associated with poorly placed com-



Figures 1a & 1b: Preoperative and postoperative frontal smile view displaying optimum esthetic plane following the lower lip curvature.



Figures 2a & 2b: Preoperative and postoperative right lateral smile view.

posites in the region of ##6-9. Active carious lesions were present in several posterior teeth (##2, 3, 12-15, 18, 19, 30, and 31). The intraoral and extraoral soft tissues were normal in appearance (Figs 1a & 1b, 2a & 2b).

The preoperative esthetic analysis using smile design principles and AACD criteria¹ revealed the following findings:

- The smile display was adequate, with a well-developed buccal corridor.
- The smile line was incorrect, with #11 impinging on the lower lip in the smile view.
- There was inadequate symmetry and proportion between ##7-10.
- Teeth ##6, 8, 9, and 11 exhibited some form of enamel hypoplasia with notch-like defects bilaterally, especially in the incisal third.
- The mid-line appeared slightly canted and not perpendicular to the incisal plane.
- The axial inclination of all four upper incisors was incorrect, which gave them a flared appearance (Figs 3a & 3b).
- The interproximal contact areas apico-incisally between ##6-11 were too long due to faulty restorations, creating inadequate cervical embrasure forms and subsequent gingival inflammation between ##8 and 9.
- The shape and contour of ##6-11 were not properly developed.
- There was no evidence of surface characterization, polychromicity, and incisal translucency of the upper incisors.
- Incisal embrasures were improperly developed, with no progression in size from centrals to canines.
- There were several stained, chipped, and failing Class III composite restorations in ##6-11.

Treatment Plan

Because all the teeth were vital, it was decided to replace the old discolored and chipped composite restorations



Figures 3a & 3b: Preoperative and postoperative retracted frontal view showing correct axial inclinations and harmonious tooth proportion.

first and then conservatively restore the patient's smile with six direct composite resin veneers. This treatment modality was chosen because the patient was young and there was more than enough enamel remaining for excellent bonding. Direct resin veneers were chosen due to the conservative nature of the procedure. Since all the planned teeth had some previous bonding done, bleaching was not considered, as it would not have affected the outcome.

The final treatment plan was as follows:

- Remove and replace all failing restorations in anterior ##6-11.
- Restore all active carious lesions in posterior ##2, 3, 12-15, 18, 19, 30, and 31.
- Equilibrate to ensure occlusal stability and longevity of all restorations.
- Carry out direct intraoral mock-up of ##6-11.
- Fabricate a palatal silicone putty index.
- Place direct composite veneers on ##6-11.

Diagnostic Intraoral Mock-up

A higher-opacity dentin body material was used to mask the existing Class III restoration and create a base shade for subsequent resin buildups. A hybrid nano-filled composite was selected for this because of optical properties similar to



Figure 4: Retracted 1:2 view showing conservatively prepared central incisors with shallow chamfer gingival margin.

The preparations were very conservative, with gross axial reduction of 0.5 to 0.75 mm.

dentin. A slightly higher-chroma dentin material was used for the cervical thirds to impart polychromy. Incisally, a translucent microhybrid was applied to provide incisal depth. An enamel nano-composite was used as the final surface layer due to high surface wear resistance and long-term polish retention. All deficient areas were augmented using composites and proper incisal

form, and embrasures were developed. The incisal edge positions were checked for smile line improvement. After the necessary occlusal adjustments, a palatal index was intraorally fabricated using a polyvinyl siloxane putty material, which makes it possible to carry this incisal edge information to the patient's mouth during fabrication of composite veneers.²

The mock-up helped to evaluate the gross treatment outcome, to confirm choice of restorative materials and shade selection for the composite veneers, and to enable direct fabrication of a palatal silicone index as a matrix during the direct buildup.³

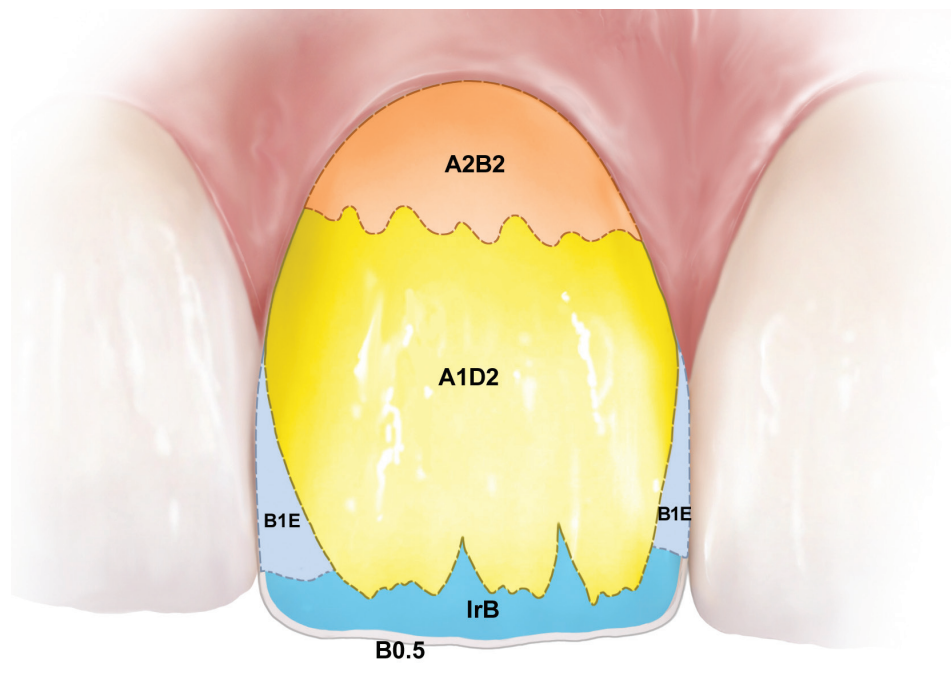


Figure 5: A color map shows the composite layering process for the restoration.

Treatment

Before the restorative phase started, the occlusion was analyzed on an articulator with well-mounted preoperative diagnostic casts. There was no significant discrepancy noted from centric relation (CR) to maximum intercuspation (MI). Protrusive movements revealed adequate disclusion of posterior teeth facilitated by the anterior guidance. Lateral movements revealed a normal canine-guided posterior disclusion. Minor occlusal equilibration was carried out by selective grinding so as to have stable holding contacts in MI. All excursive movements were verified to be free of any posterior interferences.⁴

Tooth Preparations

Teeth #6-11 were anesthetized using local infiltration with 2% lidocaine (Lignospan Special, Septodont; Saint-Maur-des-Fossés, Paris, France). All the old discolored proximal Class III composite restorations in #6-11 were first removed, the cavity preparations refined, the pulp protected with a bonded base technique and, finally, composite restorations were redone. Similarly, all active carious lesions were restored with direct composites (Synergy Duo, Coltene/Whaledent; Cuyahoga Falls, OH)

after adequate pulp protection (Vitrebond Liner, 3M ESPE; St. Paul, MN).

The preparations were very conservative, with gross axial reduction of 0.5 to 0.75 mm. The gingival margin consisted of a shallow chamfer about 0.3

A color map had been created ahead of time as a blueprint for the incremental layering technique.

mm in depth, placed using a 6844-016 round-end two-grit tapered diamond (Brasseler USA; Savannah, GA). Replacing the old Class III composites allowed for a minimally invasive facial veneer preparation design. The preparations extended sufficiently interproximally to conceal the margins. The incisal preparation was very minimal.

All preparations were finished using flexible pop-on discs (Sof-Lex, 3M ESPE) and polished with a slurry of pumice and chlorhexidine (Consepsis, Ultradent; South Jordan, UT). This preparation design not only conserves natural tooth structure, but also provides maximum enamel substrate for

a stronger bond. Considering the patient's youth, he will one day need treatment again on these teeth. It serves the patient well to preserve the maximum amount of natural tooth structure when restorations need to be repaired or replaced (Fig 4).

Incremental Layering Technique

First the central incisors were built up, then the lateral incisors, and then the canines. Clear mylar strips were used interproximally to protect adjacent teeth from being etched. A total-etch technique was used with a fifth-generation dentin adhesive system (Adper Single Bond, 3M ESPE). The technique of starting first with one central incisor and then subsequently mimicking the second incisor with the completed one was followed.⁵ Tooth #8 was first etched with 32% phosphoric acid (Bisco; Schaumburg, IL) for 15 seconds and thoroughly rinsed. The preparation surface was dried, but not desiccated. Two to three coats of the bonding resin were applied and scrubbed with a microbrush. The adhesive layer was thinned using an air syringe, then light-cured for 10 seconds.

A color map had been created ahead of time as a blueprint for the incremental layering technique



Figure 6: The body of the veneer was formed using a nano-filled composite A1D2 and sculpted to optimum contours.



Figure 7: A bluish translucent composite was used between dentin lobes to impart natural incisal translucency.



Figure 8: All teeth to be restored were built up prior to development of final labial contours.



Figure 9: A lead pencil was used to mark the transitional line angles and the mid-labial ridges of all the teeth.

(Fig 5). The first layer of composite was used to create a palatal shelf (CT, Filtek Supreme XT, 3M ESPE). This composite layer served as “scaffolding,” on which further shades and opacities were built. The silicone putty matrix was first lubricated with a composite wetting resin (Ultradent) prior to composite application. The lingual shelf layer was light-cured and the index was removed. The next layer of composite was shade B1E (Filtek Supreme XT), which was used in the proximal areas to create and define the proximal borders. The composite material was sculpted using a Greenstein Color composite instrument (Safident; Gland, Switzerland). The next layer was the cervical higher chroma composite shade A2B2 (Synergy Duo), which was carried to the preparation and sculpted in the cervical area with the Greenstein instrument. A #3 artist brush (Cosmedent; Chicago, IL) was used with a wetting resin (Ultradent) for adaptation of the composite layer without any voids. The composite was pulled incisally with the brush to thin toward the middle third of the tooth. The body of the veneer was formed using dentin material shade A1D2 (Synergy Duo). This layer was sculpted toward the incisal third of the tooth (Fig 6).

Closer to the incisal edge, this material was cut irregularly into lobes to resemble the mammelons of central incisors using a P1 composite instrument (Ivoclar Vivadent; Amherst, NY). A very thin increment of a high-value hybrid composite, shade B0.5 (Filtek Z250) was carefully placed on the incisal-most portion to simulate a “halo” effect in the final restoration using the tip of the Greenstein instrument⁶ (Fig 7).

The area between the lobes was filled with a bluish translucent composite (IrB, Vit-I-escence, Ultradent) to impart the necessary incisal translucency. A final layer of B1E was used on the surface to complete the veneer buildup. A #2 artist’s brush was used to smooth, contour, and sculpt the composite layer prior to curing. De-ox gel (Ultradent) was applied on the entire surface of the ve-



Figures 10a & 10b: Preoperative and postoperative 1:1 retracted view showing creation of seamless natural esthetics with internal effects and translucency.



Figures 11a & 11b: Preoperative and postoperative 1:1 left retracted view showing greatly improved anatomic form of incisors and canines, higher canine chroma, and perfectly formed incisal embrasures.



Figures 12a & 12b: It was very rewarding to have such a happy, satisfied patient.

neer, after which final curing was done for 40 seconds. Gross contouring, refining, and finishing were carried out for tooth #8.

The above-described incremental layering technique was followed exactly for ##9, 7, 10, 6, and 11, in that order. For ##6 and 11, a slightly higher chroma cervical shade of A3B3 as well as a body shade of A2B2 (both Synergy Duo) were used (Fig 8).

Contouring, Refining, and Final Polishing

Some of the excess resin was removed from the surface of the restoration as well as from the margins with a #12 Bard-Parker surgical blade (Becton Dickinson; Franklin Lakes, NJ). The occlusion was checked and adjusted with a football-shaped carbide. The anterior and lateral guidances were also adjusted. The primary anatomic form and contours were achieved with a series of carbide finishing burs (Safe End Series Carbide Finishing Kit, S.S White; Lakewood, NJ). To maintain and refine the primary anatomy, a lead pencil was used to mark the line angles and the central prominence on the labial surfaces of all the veneer surfaces (Fig 9).

Excess removal and contouring was done with a 10-bladed carbide finishing bur (Safe End SE8-10) because it selectively removes the composite while conserving enamel.⁷ The three facial planes of contour were carefully developed without flattening out the line angles. A 20-bladed carbide bur (Safe End SE8-20) was then used to create a smooth surface ready for polishing. The short Safe End burs SE3 and SE4 were used for interproximal spaces and the transitional areas at the gingival margin. Coarse rub-

ber abrasive points and wheels, as well as Sof-Lex pop-on discs were used to refine the contouring, create appropriate embrasures, and develop secondary anatomy. Two grits of plastic abrasive strips were used to finish and polish the interproximal area. The veneers were then polished with a series

Composite resin restorations can replace lost tooth structure very quickly and conservatively with an excellent esthetic outcome.

of fine rubber abrasive points followed by silicone carbide-impregnated nylon bristle brushes. An aluminum oxide-based composite polishing paste (Enamelize, Cosmedent) was applied with a felt cone and used with light pressure to achieve a fine luster. A final step involved buffing the entire surface of the veneers dry with a felt cone at high speed but very low pressure. Postoperative and oral hygiene instructions were given and the patient was scheduled for follow-up and postoperative photographs after two weeks (Figs 10a & 10b, 11a & 11b).

Conclusion

Composite resin restorations can replace lost tooth structure very quickly and conservatively with an excellent esthetic outcome. The wide array of shades, translucencies, and opacities of composite systems available today allow superior control in the hands of an adept clinician to create truly beautiful, lifelike three-dimensional restorations. The use of nano-technology in composite fillers has enabled us to combine high fracture strength and long-term polishability. In this case, the use of direct composite resin veneers proved to be a very conservative cosmetic option that

Dr. Hatkar shares his experiences with Case Type V in a Q&A with Dr. James Peyton.

Q: Can you address how you chose an ideal patient for your direct resin veneer case?

I select composite veneers as my restorative choice for esthetic rehabilitation of a smile in the following situations:

- In young patients where the pulp volume is at a maximum. (More aggressive preparations are required with indirect porcelain veneers, which may compromise pulp vitality.)
- In younger patients' teeth, irrespective of the type of restorations done. They would require replacement in the restorative cycle at some point, so tooth conservation is vital.
- In cases with virtually stable and harmonious occlusal relationships with no or minimal parafunctional activity.
- When minimal changes are required in the form or shape of teeth, except shade improvements and/or coverage of surface defects.
- For patients with time constraints, composite veneers enable the clinician to provide outstanding esthetics quickly.

Q: What were your major concerns and how did you handle them?

Some of the major concerns in my direct resin veneer case were:

- canted midline
- flared incisors
- faulty tooth form, contours, and surface topography
- bilateral asymmetry as well as inappropriate tooth proportions
- improperly developed incisal embrasures.

The direct intraoral composite mock-up was done preoperatively. This helped to confirm choice of restorative materials and shade selection for the composite veneers, and to enable direct fabrication of a palatal silicone index as a matrix during the direct buildup. It also provided an opportunity for esthetic, phonetic, and occlusal evaluation. It confirmed that all major issues of mid-line cant, faulty axial inclinations, and tooth proportions were addressed. The incremental buildup of the veneers was formulated and mapped. The pre-decided shades of composites were used with the previously made silicone index to sequentially build up teeth ##8 and 9, then 7 and 10; and, lastly, 6 and 11. Following proper contouring and polishing steps, I could address most of the initial concerns and achieve an optimal esthetic result.

there's more...

yielded great patient satisfaction. The patient's expectations were more than fulfilled (Figs 12a & 12b), which was immensely satisfying.

References

1. American Academy of Cosmetic Dentistry. Diagnosis and treatment evaluation in cosmetic dentistry: a guide to Accreditation criteria. Madison (WI): The Academy; 2001.
2. Dietschi D. Layering concepts in anterior composite restorations. *J Adhesive Dent.* 2001;3(1):71-80.
3. Peyton J. Mastering anterior direct composite resins to achieve accreditation results. Presented at the 24th Annual AACD Scientific Session; New Orleans, LA, May 8, 2008.
4. Dawson PE. Functional occlusion: from TMJ to smile design. St. Louis: Mosby; 2007.
5. Finlay S. Accreditation clinical case report, Case Type V: six or more direct resin veneers. *J Cosmetic Dent.* 2008;24(3):50-8.
6. LeSage B, Milnar F, Wohlberg J. Achieving the epitome of composite art: creating natural tooth esthetics, texture and anatomy using appropriate preparation and layering techniques. *J Cosmetic Dent.* 2008;24(3):132-41.
7. Glazer HS. Simplifying finishing and polishing techniques for direct composite restorations. *Dent Today.* 2009 Jan;28(1):122,124-5. **JCD**

Q & A continues

Q: What was your greatest influence in learning how to perform direct resin veneers?

My first exposure to Accreditation-level composite artistry was at a hands-on workshop conducted by Dr. Corky Willhite at the 2007 Annual AACD Scientific Session. The step-by-step guidelines that you, Dr. Peyton, gave in your direct resin course handouts at the 2008 Annual Scientific Session were very helpful. Another major influence was a hands-on workshop on direct composite veneers by Dr. Brian LeSage, Dr. Frank Milnar, and Jenifer Wohlberg at the 2009 AACD Session. The 2009 session was a turning point for me; it made me see the innumerable "invisible" criteria that make an Accreditation case successful. I am grateful to the AACD for providing the highest level of continuing education that brings out the best of a clinician's abilities.

Q: How comfortable do you feel in offering direct resin veneers as an alternative treatment option to porcelain veneers?

Over the years I have continually improved my abilities in handling composites. In India, due to lack of excellent laboratory support and economic concerns, our comfort level has always been high with direct resin veneers as a treatment alternative over porcelain veneers. The variety of shades, opacities, and translucencies combined with improved physical properties and longevity of modern composite resins make them a versatile and economically viable option, while being conservative with natural tooth structure.

Q: What challenges have you faced while working toward Accreditation due to your location?

Being in India, I had many challenges to complete each of the five Accreditation cases:

- Currently there are no laboratories in India that are fully acquainted with Accreditation-level quality in their work, or laboratory technicians who are AACD members. Effective communication with technicians about the quality of Accreditation-level work is difficult.
- Outsourcing laboratory work to any major lab in the U.S. is financially taxing for clinicians here, due to considerable differences in practice and fees. Our resources in restorative dental materials and techniques are still very limited, so we need to import from the U.S. For example, two-component silane and the composite sculpting brushes were not available in India when I procured them from the U.S. Also, while I was working on Case Type I, there were only two hard-tissue lasers in India and we had difficulty accessing them. However, I was able to use a hard-tissue laser to perform a closed flap crown-lengthening procedure with osteoplasty on my Case Type V patient.
- With the advent of pressable ceramics, a highly esthetic option like stacked feldspathic veneers has virtually been discontinued in most Indian laboratories due to poor demand and more technique-sensitive fabrication, thus increasing our dependence on outsourcing work abroad.
- Our exposure to world-class educators and courses, although increasing, is still limited compared to the U.S. or Europe.



About the Author: Dr. Hatkar is Professor and Head of the Department of Conservative Dentistry and Endodontics at the School of Dental Sciences, Krishna Institute of Medical Sciences University in Karad, Maharashtra, India. **Author Disclosure:** The author did not report any disclosures.

Examiners' Observations

Mastering the Criteria for Accreditation Case Type V

Scott Finlay DDS, FAGD, AACD Accredited Fellow
Illustrations by Dave Mazierski

Successful management of Case Type V does not occur by accident. Many candidates consider it to be the most taxing of the required case types. Because of the arduous demands placed on the dentist, case selection is crucial. Selecting a case with the appropriate indications, but without complicating multidisciplinary factors, will certainly increase the opportunity for a favorable outcome.¹ No extra points are given for undertaking a complex case. In fact, the opposite is true; points can be deducted for falling short of resolving all the complicating factors. Case selection involves an assessment not only of the clinical aspects of the case, but also of the emotional appraisal of the patient's willingness and availability for extended chair time and the probability of multiple visits. Candidates can avoid frustration and disappointment connected with an inordinate amount of time spent on a case that does not provide the best opportunity to display their talents, skills, and knowledge, by working with and reviewing potential cases with a mentor.

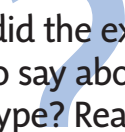
Selecting a case with the appropriate indications, but without complicating multidisciplinary factors, will certainly increase the opportunity for a favorable outcome.

Examiners certainly have a deep appreciation for the toil and commitment involved in Case Type V. Their calibrated focus engages several important criteria with the simple question: Has the candidate achieved excellence? "Excellence" indicates a mastery of skill and knowledge and should not be viewed as an attempt at perfection. In Case Type V, the examiners are looking at the candidate's ability to manage the parameters of smile design and choreograph the application of direct resins to create a natural appearance. Case Type V is also a technique case. The candidate must capture images that illustrate the chronological process used to accomplish the results. In an era of responsible esthetics, in most situations this particular case type lends itself to very conservative tooth preparations. Deliberate, uniform, and aggressive preparations are no longer necessary to create an esthetic and natural result.

Dr. Hatkar should be complimented on his management of this demanding case. He carefully assessed the functional and esthetic requirements through model analysis and mock-ups prior to initiating treatment.² He did his homework. Although this case required absolute recreation of the facial surfaces of the teeth, the multidisciplinary features of the case were minimal. The occlusal scheme required very little augmentive correction and the periodontal architecture did not require significant changes. His technique slides revealed great conservation of existing tooth structure to achieve the desired result. Dr. Hatkar also utilized a stratification layering technique that was effective in creating a polychromatic, natural result.³

The examiners passed Dr. Hatkar's case unanimously. Some criteria, however, are worthy of comment.⁴

- 34. *Is the photography free of excess moisture and debris?* Candidates will present their best opportunity for success by having photography that is free of all debris. Debris was noted between teeth #6 and #7.



What did the examiners have to say about this Case Type? Read on.

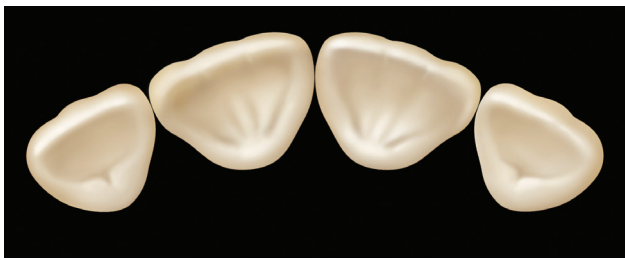


Figure 1: The occlusal view is an excellent perspective from which to evaluate the management of proximal contours, line angles, and facial embrasures.



Figure 2: The lateral views should visually define the presence of the multiple planes of facial contour typically observed in nature.

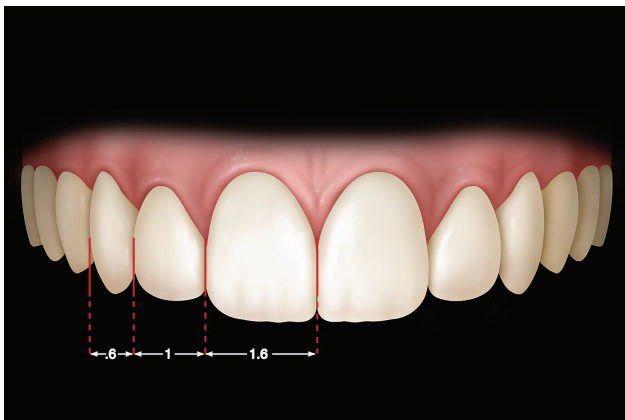


Figure 3: This proposed proportion is based upon the visually apparent width from the frontal view. Contralateral teeth should display balance and harmony. In particular, the central incisors should mirror each other.

- 42/43. Is the labial anatomy (primary, secondary, and tertiary) appropriate? Are there three planes for the labial contour of the central incisor? Have line angles been properly developed? Management of the line angles and facial anatomy often can be best evaluated from the occlusal view. A common fault seen in Case Type V is the elimination or muting of carefully developed facial anatomy and line angles in the process of finishing the case. From the occlusal view, the slightly convex contours of the facial surfaces of #8-11, and the lack of harmony and definition of the mesial and distal line angles were noted (Figs 1 & 2).⁵
- 61. Is margin placement and design appropriate? Are the margins visible? The restorative material should blend invisibly with the surrounding tooth structure. Upon reasonable examination, it should be difficult to discern restorative material from the tooth.⁶
- 87. Are contralateral teeth in harmony in terms of size, shape, and position? Candidates will find that in Case Type V, a significant amount of effort will be focused on creating symmetrical contralateral teeth, which always begins with the centrals. In this case, the lack of balance between the centrals was noted (Fig 3).⁷

Most criteria noted to be deficient in Dr. Hatkar's case were considered to be minor faults. This case represents a very good example of a dramatic improvement in the patient's appearance, as well as a demonstration of mastery of the criteria required to meet the standard of excellence in Case Type V.

References

1. Dietschi D. Optimising aesthetics and facilitating clinical application of free-hand bonding using the 'natural layering concept.' *Br Dent J.* 2008 Feb 23;204(4):181-5.
2. Dawson PE. *Functional occlusion: from TMJ to smile design.* St. Louis: Mosby; 2007. p. 366-77.
3. Finlay S. Conservative esthetics using direct resin. *Inside Dent.* 2010 May;6(5):96-101.
4. American Academy of Cosmetic Dentistry. Accreditation examination criteria. Madison (WI): The Academy; 2009.
5. Blitz N, Steel C, Willhite C. Diagnosis and treatment evaluation in cosmetic dentistry: a guide to Accreditation criteria. Madison (WI): American Academy of Cosmetic Dentistry; 2001. p. 22-24.
6. *ibid.*, p. 41-42.
7. *ibid.*, p. 16-17. **JCD**



About the Author: Dr. Finlay is an AACD Accredited Fellow and has been an AACD Accreditation Examiner since 2008. A 1986 graduate of the University of Maryland, Baltimore College of Dental Surgery, Dr. Finlay practices in Arnold, Maryland.