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Treatment Options with Anterior Veneers

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ABSTRACT

Minimally invasive dentistry has developed from the concept of preventing and halting oral disease to preserve oral hard tissues before it requires treatment. In contrast to the concept of 'extension for prevention' in the time of G.V. Black when preventive products were not available. Similarly, minimally invasive restorative dentistry has developed since the availability of adhesive systems rather than relying (solely or partially) on preparation form for retention. This has evolved further in other fields of dentistry, with less invasive methods being used in endodontics, orthodontics, oral surgery and tissue regeneration. Esthetics has also grown in importance in daily practice and is an important factor for patients in determining what types of treatment to consider. In restorative dentistry, it is now possible to provide patients with durable, minimally invasive, esthetic direct and indirect restorations that spare tooth structure and meet these needs.

EDUCATIONAL OBJECTIVES

The overall goal of this course is to provide an overview of minimally invasive dentistry, focusing on restorative esthetic dentistry. After reading this article, participants will be able to:

1. List areas of dentistry that have benefitted from minimally invasive approaches.
2. Review the contribution of adhesive systems to esthetic restorative dentistry.
3. List and describe the factors involved in the provision of durable, esthetic, and minimally invasive restorations.
4. Review approaches to treatment of the anterior dentition that preserve tooth structure while meeting the esthetic goals of the patient and clinician.

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Dr. Harois discloses that he is a lecturer for NuCalm, Den-Mat and Terec Dental Laboratories.

Introduction

Minimally invasive dentistry is embodied by the concept of preventing and halting oral disease to preserve oral hard tissues before invasive treatment is required. In-office and home-use fluorides are recommended and effective for the control of dental caries, to prevent carious lesions that would require invasive treatment.[1] Dental caries can be arrested and hardened, including in dentin in young patients. Pit and fissure sealants are an effective, recommended intervention for the prevention of dental caries in pits and fissures in children and adults.[2,3] These procedures are in stark contrast to the practice of 'extension for prevention' whereby amalgam restorations were placed after the

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preparation had been fully extended to include the whole area of pits and fissures (or a widely opened Class II proximal box).[4] While the goal of removing anatomical structure was to prevent disease or for access, this practice removed healthy tooth structure and compromised these teeth.

Resin-based sealants became possible only when adhesive technologies were developed that made it possible to bond materials to tooth structure. Similarly, the advent of minimally invasive restorative dentistry, including esthetic direct and indirect composite restorations, has relied on durable restorative materials, and to a great extent on adhesive systems that also reinforce tooth structure through bonding the materials to the tooth structure. From the perspective of minimally invasive restorative dentistry, bonded composite restorative procedures are performed without having to remove tooth structure to create mechanical retention or undercuts.[5] The area involved can be minimized. Currently available composites offer strength, low polymerization shrinkage, excellent esthetics, and durability. Physical handling can also be optimized for a given procedure by selecting from flowable and packable composites.

The advent of minimally invasive restorative dentistry has relied on durable restorative materials, and to a great extent on adhesive systems.

The introduction of adhesive systems occurred after early experiments demonstrated retention of resins after etching enamel.[6] The etch-and-rinse technique was the first to be developed.[6] Options in adhesive dentistry now include etch-and-rinse (total etch), self-etch and universal adhesives. As their name suggests, self-etch adhesive systems do not include a separate etching step and the adhesive either contains the etchant in the primer, or it is a one-step procedure where the etchant, primer, and bonding agent are all contained in the same liquid. Composite resin bonding is achieved through micromechanical locking into etched surfaces. Significant advances have occurred concurrently for indirect restorative materials. Current indirect restorative materials offer greater esthetic compatibility with the natural dentition, increased strength, and reduced wear. In addition, strength and fabrication techniques now allow thinner restorations, which is particularly important for veneers, and provide an esthetic solution with reduced destruction of dental hard tissues.[7] Adhesive techniques for modern ceramics now utilize silanization, hydrofluoric acid etching, and sandblasting, depending on the material, to increase the surface area available for bonding. Together, these developments have offered opportunities for minimally invasive techniques.

The Anterior Esthetic Zone

Increasingly, esthetics is considered important by patients, and discoloration/misalignment of teeth is poorly accepted.[8,9] These trends help to fuel demand for esthetics, which has driven developments, for example, in tooth whitening (bleaching) products and orthodontics. The number of adult orthodontic cases has increased over the last two decades, in part due to the availability of clear aligners that are less visible than fixed orthodontic appliances. Crowns and veneers are alternatives to orthodontic treatment, or may be used following orthodontic treatment, in appropriate cases. The ability to impart a high polish and luster in composite materials results in excellent esthetics and reduces surface roughness (and as a result, reduces the potential for stain). Options for direct restorations include single-increment or multi-increment techniques (depending on the depth and specific composite), use of a universal shade, composites with a chameleon effect that results in composite blending well with the surrounding tooth structure, and dual- or multi-shade layering techniques. The choice is influenced by the complexity of the case and esthetic demands. Esthetics is significantly more impactful in the anterior esthetic zone than posteriorly.

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The loss of a tooth is a major event for patients, especially loss of an anterior tooth. Options following tooth loss historically included wearing removable partial dentures that were uncomfortable, typically unstable and could induce damage to adjacent hard and soft tissues. The other option was to provide the patient with a three-unit fixed (cemented) prosthesis, requiring that adjacent tooth structure be destroyed since full crown preparations of the neighboring teeth were needed. Once reliable adhesive systems became available, an etched and bonded Maryland bridge became an option. This made it possible to replace a missing tooth with minor modifications to the palatal surfaces of the adjacent teeth. Since then, implant-support restorations have become a routinely selected option. While implant placement requires surgery, it does not require modification of adjacent teeth and from the perspective of saved tooth structure is minimally invasive. In some cases, a Maryland bridge may still be a treatment chosen by patients (for example, by a patient who does not want implant treatment) (Figures 1, 2).

Tooth whitening (bleaching) is an option for discolored teeth. Single teeth with discoloration following endodontic treatment can also be bleached, with appropriate case selection. However, certain types of discoloration, such as moderate to severe fluorosis may be challenging, and alternative treatments can be considered. Depending on the particular case, microabrasion, microabrasion plus bleaching, crowns, veneers, or a combination of crowns and veneers can provide solutions for discoloration (Table 1). In addition, veneers may be an option for replacing contours, closing diastemas, covering large restorations, addressing crowding, and treating peg laterals and hypoplastic teeth.[10-13] (Figures 3, 4) Responsible esthetics means removing the least amount of tooth structure necessary for the desired esthetic result, and should be the norm, not the exception. All treatment options should also be presented to patients, and written informed consent obtained once definitive treatment has been chosen. Clear patient communication is also essential to ensure that patient expectations and treatment outcomes are understood by both the patient and clinician.

TABLE 1. Potential indications for veneers
Tooth discoloration
Tooth misalignment
Masking diastemas
Large visible restorations
Replacing contours
Peg laterals
Hypoplastic teeth

Figure 1. Pretreatment image showing missing upper incisor

Figure 2. Minimally invasive Maryland bridge

Figure 3. Patient presentation with crowded, stained dentition

Figure 4. Treatment with indirect veneers

Anterior Veneers

Veneers provide a minimally invasive treatment option compared to crowns and preserve significantly more tooth structure, provided sufficient healthy tooth structure remains. Depending on the case, it may be possible to create veneers with no or minimal reduction of tooth structure. Particularly in adolescents, techniques that do not involve reductions in tooth structure are preferable due to the larger pulp chambers in younger patients. Careful treatment planning is required to ensure that the functional occlusion, gingival tissues, and tooth alignment will enable functionally and esthetically successful treatment with veneers.[8] Options include direct composite veneers ('freehand' veneers), chairside veneers created using a veneer system, chairside-milled ceramic veneers, and prefabricated composite or ceramic veneers that are laboratory fabricated and may or may not include use of a template system[11] (Table 2). The adhesive system and procedure used for anterior veneers depends upon the method and the material from which the veneer is created.

Patient Communication

Patient communication is a key factor in discussions on treatment options and related decisions that patients make. When patients are considering elective esthetic treatment options, this becomes more important. Clear communication and patient information are essential, and may lead to greater treatment acceptance, compliance, and superior long-term outcomes. The availability of digital technology and imaging has made it possible to show patients digital clinical and photographic images, and 3D images, improving patient communication and informed consent.[14] Treatment options can be explained using on-demand video clips and animations, and software programs allow information to be personalized. Technology options include chairside built-in imaging, iPads, tablets, and smartphones.[15] Simulation technology and 3D imaging on computers, iPads, tablets and smartphones and mobile apps also enable clinicians across disciplines to show before images and simulated after images, giving patients a better understanding of procedures and treatment outcomes.[16-18] Depending on the program, personalized images such as before and after images for veneers can also be viewed on a smartphone at home with friends and family.

TABLE 2. Options for veneers
Direct composite ('freehand') veneers
Direct chairside veneers with veneer shells
Chairside-milled ceramic veneers
Indirect in-office prefabricated composite veneers
Indirect laboratory-fabricated composite or ceramic veneers
Indirect veneers using a template system

In addition, patient communication during treatment and visualization of the proposed treatment outcome can be aided through the use of mock-ups; for instance, by creating veneer mock-ups on a model. These can then be shown to patients on a model, or a trial design can be produced, or images of the mock-up veneers can be superimposed on an image of the patient's smile or full face.[8] Meeting each patient's expectations and delivering on these for esthetic restorations and smile makeovers should be predictable and precise. The ability for a patient to 'test-drive' the proposed outcome with a provisional results in accurate patient-approved restorations and removes potential anxiety on the final outcome both for patients and clinicians.

Direct Composite Veneers

Direct 'freehand' composite veneers provide a one-visit or a two-visit solution for patients.[19,20] They may be placed with no tooth preparation or a slight chamfer, preserving tooth structure, or tooth structure may need to be selectively reduced to create space. It is essential that a composite with high polish and luster properties, e.g., a microhybrid or nanohybrid composite, is used to obtain the best esthetic results. To select the shade(s), a small amount can be placed on the tooth surface and cured to determine that this blends and for patient acceptance. Current composites are available in multiple shades, can blend with adjacent tooth structure through a chameleon effect, and offer varying degrees of flowability.[21] The amount of layering and volume of composite that will be required must be considered, and whether or not this will result in a bulky appearance.

In more difficult and complex cases, it is advisable to use a two-visit procedure. Impressions are taken at the first visit, and a wax-up of the proposed veneers is created on the poured stone model. A silicone index can be made and used to help fabricate the direct composite veneers at the second visit. In particularly complex cases, acrylic try-in veneers can be made first to make sure the patient likes the proposed shape and form before direct composite veneers are created.[20]

Etch-and-rinse adhesives typically offer greater tensile bond strength to enamel and are recommended for clinical cases where greater retention is required and where bonding to enamel is solely or largely responsible for retention.[22,23] Phosphoric acid is used to etch the enamel or enamel and dentin. The enamel surface is commonly etched with 37% phosphoric acid for between 15 and 30 seconds in accordance with the manufacturer's directions. During the etching process, the adjacent tooth can be protected by placing a thin clear matrix strip/separating strip between the teeth. After etching, the area is then rinsed and dried, and a primer is then applied and may be left uncured or be cured depending on the clinical case. This is followed by application of the bonding agent prior to placement of the restoration. In the case of two-step etch-and-rinse adhesives, the tooth structure is first etched, and the primer and bonding agent are combined into one step.[24] If veneers are being placed over fluorotic enamel, longer etching times of up to 90 seconds may be required depending on the severity of the fluorosis.[25] Direct composite veneers are suitable for adolescents and adults, relatively inexpensive, and easy to repair or replace.[20] Their fabrication does not incur laboratory fees. However, they are technique-sensitive. Depending on the demands and complexity of the case, they may require considerable chairside time as well as in-office laboratory time. One evaluation found that survival rates were higher in vital than nonvital teeth.[26] In one study, a success rate of 89% was found for direct composite veneers.[27]

Direct composite veneers are suitable for adolescents and adults, relatively inexpensive, and easy to repair or replace.

One-Visit Composite Veneers with Prefabricated Shells

Chairside systems are available for one-visit veneers. One option is a system that provides a clear template for the required tooth preparation, a shade guide for the enamel and dentin shades of the nanohybrid composite that will be used, and a prefabricated composite veneer.[28] This simplifies preparation, still permits a one-visit treatment with veneers, and reduces chairside time. The clinician must select the correct template and veneer for an individual tooth, minimal tooth preparation is required, and the veneer may need to be adapted

for the individual patient, to achieve the desired esthetic result. Using a two-step etch-and-rinse technique, the tooth surface is etched, and the primer/bonding agent applied and polymerized in accordance with the manufacturer's instructions for use. Bonding agent is also applied to the veneer and left unpolymerized. The dentin shade of composite luting cement is then thinly applied to the tooth surface and the enamel shade to the veneer (over the bonding agent). Next, the veneer (along with the enamel shade composite it contains) is placed over the dentin shade composite on the tooth surface, held in position, checked for placement and occlusion, and the materials are then polymerized facially and incisally.[28]

Indirect Prefabricated Veneers

Indirect veneers may be prefabricated in the office in composite or a hybrid composite-ceramic material, in the laboratory using traditional techniques or CAD/CAM ceramic or composite blocks, or by using an indirect veneer system. In all three situations, an initial impression is taken, and a mock-up and provisional can be created. Patient expectations and desires for an esthetic result can be refined by adjusting a bonded provisional until the patient is completely happy with the result. At that point, a scan or impression can be taken and sent to the laboratory, and the approved shape recreated on a master model. Particularly for cases involving a smile makeover, using an American Academy of Cosmetic Dentistry (AACD) smile design, a custom wax-up and provisional to check facial form and smile means that each patient has a clear understanding of the proposed esthetic outcome.

Indirect Composite Veneers

Indirect composite veneers created in the dental office offer several advantages compared to direct composite (freehand) veneers. Less chairside time is required than with direct veneers. In addition, the stone model can be used first to create a mock-up, obtain the patient's approval for the design, and then make a silicone index that can be used to fabricate the final composite veneers on a silicone model. The veneers can be fabricated and customized on the stone model whether or not a mock-up was created, finished, and polished prior to placement. When seating the veneers, a total-etch technique can be used with a flowable composite as the luting agent. Prior to applying adhesive to the inner surface of the veneer and gently drying this, the inner surface can be sandblasted with aluminum oxide to clean the surface and increase the available surface area for bonding.[8] Indirect prefabricated composite veneers also offer reduced prepolymerization stress, and marginal adaptation is reported to be superior with reduced microleakage.[28] In the case of indirect composite veneers created from CAD/CAM composite blocks, further advantages compared to direct composite veneers include automation and time savings. Conversely, CAD/CAM restorations necessitate the use of CAD/CAM technology for which a significant investment is required, or a laboratory fee is incurred. Luting agents were found in one study to bond better to composite than ceramic CAD/CAM blocks.[29] A recent review noted that adhesive systems are more effective for CAD/CAM indirect resin materials when sandblasting or hydrofluoric acid is used on the inner surface of the material, followed by silanization.[30] The manufacturer's instructions for the treatment and adhesion of indirect CAD/CAM composite blocks must be followed.

Figure 5. Patient presentation with moderate to severe fluorosis and anterior misalignment

Figures 5-8 courtesy of Dr. Howard Strassler

Indirect Ceramic Veneers

The case below shows the result of indirect laboratory-fabricated ceramic veneers that were provided for a patient with fluorosis and misaligned anterior teeth (Figure 5). The teeth were prepared minimally with a chamfer, while removing sufficient volume on the distal areas that were rotated outward (Figure 6). A final impression was taken for the indirect veneers (Figure 7). The indirect veneers provided an esthetic solution that the patient was delighted with (Figure 8). Ceramic veneers were reported in a review published in 2000 to have an estimated 91% probability of survival for a 10-year period.[31] Since then, significant improvements in options, material properties and adhesive technologies have occurred. In a systematic review of glass-ceramic laminate and feldspathic porcelain veneers, the cumulative survival rates were 94% and 87%, respectively, with a median follow-up of 9 years.[32] The most frequent complication was fracture/chipping. In one study assessing almost 600 porcelain laminate veneers over an up to 12-year period, a survival rate of 99% was found for veneers that involved enamel only (i.e., no dentin was reduced or exposed during treatment with veneers) and 95% for those involving dentin and with enamel only present at the margins.[33] In another study, similar survival rates were found for veneers involving only enamel or enamel and minimal dentin reduction and significantly lower survival rates for those involving extensive dentin exposure.[34]

Figure 6. Conservative enamel reduction

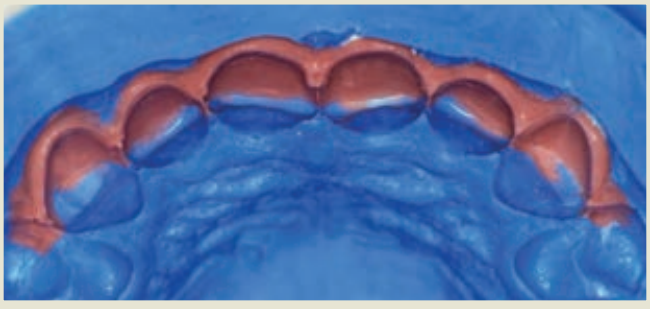

Figure 7. Elastomeric impression after enamel reduction

Figure 8. Esthetic ceramic veneers

Indirect Ceramic Veneer System

A third method utilizes a system that includes patient communication tools, guidance on potential tooth surface and gingival margin modifications, and creates laboratory-fabricated leucite-reinforced pressable ceramic veneers. These are pressed to full contour, cut back, and layered to achieve a natural result for shade and value. They provide strength, translucency for esthetics and can be pressed to as little as 0.3-mm thickness. Using the additive reductive template (ART) as guidance, the trial smile and customized veneers provided removes guesswork and anxiety. The case below shows use of this method.

A new patient attended for a consultation. Her chief complaint was discoloration, which she indicated had been caused by tetracycline, together with crazing in the enamel of the upper incisors. On full examination, it was found that the patient had tetracycline staining and discolored and unesthetic composite resin restorations. Significant crazing of the enamel was also present in the upper incisors, particularly the laterals (Figures 9, 10). A full examination was performed and radiographs taken. The patient did not have new caries lesions, and her periodontal condition was good. All treatment options were discussed with the patient, includ-

Figure 9. Retracted view of initial presentation
Case courtesy of Dr. Louis Kaufman

Figure 10. Pretreatment smile

Figure 11. Wax-up of proposed veneer shapes and arch

Figure 12. Color-coded guidance model indicating areas for reduction.

Note yellow areas where enamel reduction is indicated, orange areas where freestyle reduction is required for the interproximal embrasures, and gray markings where the enamel needs to be beveled.

ing bleaching and restorative treatment for the restorations. Patient communication tools were used during this discussion. Crowns were rejected as an option early in the process as these would require substantial loss of tooth structure and more conservative options are available. After considering all options, she opted for minimally invasive indirect veneers.

At the patient's first visit, elastomeric (PVS) impressions, a full bite registration, and full face frontal and lateral images with the patient smiling were obtained, and a facebow bite plane. These were sent to the laboratory together with the prescription. ART was selected and filled in for strategic reduction only. The patient had indicated that she would accept some minor reduction on areas of the teeth where this would improve final esthetics.

A week later, the waxed model, index, template and models were returned. The waxed model was shown to the patient first to check that she was happy with the proposed shape of the veneers (Figure 11). The patient was shown the model indicating the minimal amount of tooth structure that would be removed to achieve an esthetic result (Figure 12). These models are color coded. The yellow areas represent the sites that will be reduced using the template. The orange areas represent areas where freehand softening of the contours is performed, and the gray areas indicate those that need to be beveled. The green template was then fitted over the patient's dentition and the indicated areas were reduced (Figures 13, 14). Next, the index that had been created from the waxed model was used to create a trial smile for the patient using a high-quality provisional material (Figure 15). This allowed the patient to view the proposed shape of the veneers intraorally and to approve them before proceeding. At this point,

Figure 13. Reduction template

Figure 14. Incisal view of reduction template

the trial smile was removed, the area cleaned and an impression taken. It was decided to leave the trial smile out, since minimal reduction had occurred. Had the patient desired a different esthetic result, the trial smile could have been adjusted until the patient was completely happy with the result, before taking a scan or impression to enable the shape to be recreated digitally on a master model.

A week later, the patient returned for the seat appointment. The clinical site was examined and cleaned to remove any debris. An esthetic, high-strength, dual-cured resin luting cement was selected and the shade that in combination with the veneers would provide the best esthetic result was selected. Prior to luting the veneers, a water-soluble try-in paste of the correct shade was used to place the veneers in position and check the fit, the proposed shade of luting cement and that the patient would be happy with the result. After removing the veneers and the try-in paste from the veneers and tooth surface, these

Figure 15. Silicone index over wax-up

Figure 16. Example of the placement device against veneers

Figure 17. Final esthetic indirect veneers

Figures 9-17 courtesy of Dr. Louis Kaufman.

were rinsed and dried. The inner surface of the veneers was first etched with hydrofluoric acid. We used a 2-step total-etch technique for the enamel, first etching, rinsing, and drying the surfaces. Next, silane primer was applied to the inner surface of the veneers to maximize the bond between the ceramic and the resin luting cement.[35,36] Primer/bonding agent was also applied to the tooth surface, and since there was no dentin involvement, agitating the primer on the tooth surface was not

required. The luting cement was then placed in the veneers, and these were seated and held using a placement device (Figure 16). After tack curing, placement was checked, and excess luting agent removed before fully curing the luting cement and rechecking excursions and removing residual excess cement. The patient was delighted with the result and with her chosen shade for the veneers.

Conclusions

Minimally invasive and noninvasive dentistry has evolved further in other fields of dentistry, with less invasive/more conservative methods being used in endodontics, orthodontics, oral surgery, and restorative dentistry.[37-39] Within restorative dentistry, current technologies make it possible to treatment plan and create durable, minimally invasive direct and indirect esthetic restorations. Anterior veneers are a minimally invasive treatment in comparison to some alternatives, give patients the ability to select treatment that preserves tooth structure, and meets esthetic demands.

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1. Minimally invasive dentistry is embodied by the concept of preventing and halting oral disease to _____.
a. reduce the amount of treatment needed
b. preserve oral hard tissues
c. reduce

2. The advent of minimally invasive restorative dentistry has relied on _____.
a. durable restorative materials
b. reimbursement
c. adhesive systems
d. a and c

3. The _____ technique was the first adhesive method to be developed.
a. selective etch
b. etch-and-rinse
c. self-etch
d. universal adhesive

4. A self-etch adhesive system is always a one-step procedure with the etchant, primer, and bonding agent contained in the same liquid.
a. True
b. False

5. _____ bonding is achieved through micromechanical locking into etched surfaces.
a. Amalgam
b. Composite resin
c. Glass ionomer
d. All of the above

6. _____ now enable thinner restorations than were historically possible.
a. Strength and low shrinkage
b. Fabrication techniques and improved decontamination
c. Strength and fabrication techniques
d. Primers and translucency

7. Sandblasting is a method that improves bonding by _____.
a. increasing the available surface area
b. depositing silica grit on the surface
c. removing imperfections on the inner surface
d. all of the above

8. The ability to impart a high polish and luster in composite materials results in _____.
a. transference
b. excellent esthetics
c. reduced surface roughness
d. b and c

9. Clear patient communication is essential to ensure that patient expectations and treatment outcomes are understood by the _____.
a. patient and clinician
b. patient, clinician, and front desk
c. patient, clinician, and family
d. patient

10. Techniques that do not involve reductions in tooth structure are preferable for _____due to the presence of larger pulp chambers.
a. younger adults
b. adolescents
c. middle-aged adults
d. elderly patients

11. Veneers provide a minimally invasive treatment option compared to crowns and preserve significantly more tooth structure.
a. True
b. False

12. Careful treatment planning is required to ensure that the _____ enable successful treatment with veneers.
a. gingival tissues
b. functional occlusion
c. tooth alignment
d. all of the above

13. The _____ used for anterior veneers depend upon the method and material from which the veneer is created.
a. adhesive system and procedure
b. adhesive system and outcome
c. procedure and time of placement
d. adhesive system and use of temporization

14. The amount of layering that will be required must be considered for indirect ceramic veneers.
a. True
b. False

15. Clear communication and patient information may lead to _____.
a. greater treatment acceptance
b. compliance
c. superior long-term outcomes
d. all of the above

16. _____ typically offer greater tensile bond strength to enamel than other techniques and are recommended for clinical cases where bonding to enamel is solely or largely responsible for retention.
a. Self-etch adhesives
b. Etch-and-rinse adhesives
c. Selective etch techniques
d. Universal adhesives

17. If veneers are being placed over fluorotic enamel, longer etching times of up to 90 seconds may be required.
a. True
b. False

18. One evaluation found that _____ rates were _____ in vital than nonvital teeth.
a. survival; lower
b. survival; higher
c. success; lower
d. success; higher

19. Mock-ups can only be created when doing indirect laboratoryfabricated veneers.
a. True
b. False

20. In a systematic review of glass-ceramic laminate and feldspathic porcelain veneers, the cumulative survival rates were _____, respectively, with a median follow-up of 9 years.
a. 67% and 97%
b. 74% and 87%
c. 87% and 85%
d. 94% and 87%

21. In one study assessing porcelain laminate veneers over an up to 12-year period, a survival rate of 99% was found for veneers that involved _____.
a. dentin only
b. enamel only
c. enamel and dentin
d. nonvital teeth only

22. A recent review noted that adhesive systems are more effective for CAD/CAM indirect resin materials when _____ is used on the inner surface of the material, followed by _____.
a. hydrofluoric acid; silanization
b. sandblasting or hydrofluoric acid; silanization
c. sandblasting; silanization
d. silanization; sandblasting

23. A laboratory-fabricated leucite-reinforced ceramic veneer is available that can be pressed to as little as _____ thickness.
a. 0.2 mm
b. 0.3 mm
c. 0.4 mm
d. 0.5 mm

24. An additive reductive template is used to guide the _____ in one method of treatment with veneers.
a. clinician
b. assistant
c. patient
d. laboratory technician

25. A range of shades is available for selection when using _____.
a. all adhesive agents
b. esthetic resin luting cements
c. wax-ups
d. any resin luting agent

26. An oil-soluble try-in paste should be used to check the fit of veneers.
a. True
b. False

27. The first step in the bonding procedure for the inner surface of a leucite-reinforced ceramic veneer is to _____.
a. etch it with hydrofluoric acid
b. etch it with phosphoric acid
c. sandblast it with aluminum bauxite
d. siliconize it

28. During application to the tooth surface, if there is no dentin involvement, the primer _____.
a. is not required
b. does not need to be agitated
c. must be agitated
d. should be applied in 2 layers

29. Minimally invasive methods are being used in _____.
a. endodontics
b. orthodontics
c. oral surgery
d. all of the above

30. Anterior veneers can give patients the ability to select treatment that preserves tooth structure and meets esthetic demands.
a. True
b. False

CE ANSWER FORM (E-mail address required for processing)

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EDUCATIONAL OBJECTIVES

- List areas of dentistry that have benefitted from minimally invasive approaches.
- Review the contribution of adhesive systems to esthetic restorative dentistry.
- List and describe the factors in the provision of durable, esthetic. and minimally invasive restorations.
- Review approaches to treatment of the anterior dentition that preserve tooth structure while meeting the esthetic goals of the patient and clinician.

COURSE EVALUATION

Please evaluate this course using a scale of 5 to 1, where 5 is excellent and 1 is poor.

1. Clarity of objectives ..... ⑤ ④ ③ ② ①
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3. Benefit to your clinical practice ..... ⑤ ④ ③ ② ①
4. Usefulness of the references ..... ⑤ ④ ③ ② ①
5. Quality of written presentation ..... ⑤ ④ ③ ② ①
6. Quality of illustrations ..... ⑤ ④ ③ ② ①
7. Clarity of quiz questions ..... ⑤ ④ ③ ② ①
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3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	18.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	19.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
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