An overview of treatment considerations for esthetic restorations: A review of the literature

Steven Judd Sadowsky, DDS[a]
School of Dentistry, University of Southern California, Los Angeles, Calif

Controversy persists regarding the treatment planning criteria for esthetic restorations. This article reviews the literature regarding the biocompatibility, marginal adaptation, color matching, patient selection, technique sensitivity, and mode and rate of failure of tooth-colored restorations. A Medline search was completed for the period from 1986 to 2006, along with a manual search, to identify pertinent English peer-reviewed articles and textbooks. The key words used were *amalgam*, *posterior composite resin*, *ceramic inlays/onlays*, *CEREC*, *porcelain laminate veneers*, *all-ceramic crowns*, and *all-ceramic fixed partial dentures*. (J Prosthet Dent 2006;96:433-42.)

The demand for tooth-colored restorations has grown considerably during the last decade.[1] This phenomenon has been both a bane and a boon to the dental profession. Rush-to-market products, media-driven treatment plans, as well as dentists eager to please, have formed a disquieting triad with little regard for the risk/benefit calculus of dental rehabilitation. On the other hand, new materials wedded to precise techniques have emerged to blur the interface between biologic and artificial structures.[2] For example, dentin is now understood as a biological composite of a collagen matrix, which is highly filled with nanometer-sized apatite crystals.[3] Demineralizing the collagen fibrils and filling the voids with resin tags can result in a hybrid or a true biopolymer. However, successful adhesion can be highly technique and substrate sensitive, often hinging on proper material and patient selection.[4] Evidence-based dental research offers a dispassionate reference for the applicability, procedures, and prognosis of tooth-colored restorations. To further that aim, this literature review investigated the biocompatibility, marginal adaptation, color matching, patient selection, technique sensitivity, and mode and rate of failure of esthetic restorations from a search of peer-reviewed English dental literature from 1986 to 2006, using Medline as well as a manual search of pertinent dental textbooks. Key words used were *amalgam*, *posterior composite resin*, *ceramic inlays/onlays*, *CEREC*, *porcelain laminate veneers*, *all-ceramic crowns*, and *all-ceramic fixed partial dentures*.

REPLACEMENT OF SILVER AMALGAM RESTORATIONS

The esthetic revolution began in the 1970s, coincidentally, with the observation that mercury vapor was released from amalgam, especially during the process of mastication, and that this vapor could be inhaled.[5] In fact, mercury toxicity has become a compelling rationale for replacing amalgam restorations with tooth-colored materials, despite a lack of consensus due to conflicting studies.[6-17] Flaws in research methodology have been cited by both proponents and detractors of amalgam restorations.[5,9,16] However, recently, a 7-year randomized clinical trial was completed involving 507 children, 8 to 10 years old.[18] Half of the subjects were treated with amalgam restorations, and the others were restored with composite resin. There were no statistically significant differences in measures of memory, attention, visuomotor function, or nerve conduction velocities for the amalgam and composite resin groups over 7 years of follow-up. Starting at 5 years after initial treatment, the need for additional restorative treatment was approximately 50% higher in the composite resin group. Furthermore, Ritchie et al[19] completed a psychomotor survey of 180 dentists and unmatched controls after analyses of amalgam surfaces and urine, hair, and nail specimens. The findings revealed that the dentists, in fact, had 4 times the concentration of urinary mercury than the control group and significantly more reports of kidney disorder and memory disturbance. However, the authors concluded that there was no significant association between concentrations of mercury and these disorders. They suggested that other potential nephrotoxic agents used in dental practice, including methylmethacrylate and composite resins, may be responsible for increased protein excretion. In summary, epidemiological and clinical studies have failed to find a link between chronic mercury toxicity and body burden of mercury in patient populations or dental personnel.[20,21]

Notwithstanding the apparent limited potential for toxic effects, the criteria for amalgam replacement has been beset with bias.[22] Bogacki et al[23] reported that amalgam restorations are replaced by a new dentist 7 times more often than if the patient continues to be seen by the original dentist. Furthermore, dentists are more likely to replace amalgam restorations than to repair them, despite their low long-term secondary caries rate.[24,25] However, the need to replace such restorations may be highly dependent on the oral hygiene of the

Presented before the Academy of Prosthodontics Annual Meeting, San Francisco, Calif, May 2006.
[a]Associate Clinical Professor.

patient.[26] In spite of the fact that amalgam restorations afford only a reasonably close adaptation to the walls of the prepared cavity, leakage decreases as the restoration ages intraorally, caused by corrosion products that form along the interface between the tooth and restoration.[27] Given that the primary mode of failure in amalgam restorations is bulk fracture, and approximately 90% of even extensive amalgam restorations are still functional after 100 months, replacement is not often necessary for reasons other than esthetics.[28,29] However, a cost/benefit analysis is essential if a tooth-colored material is considered as a substitute.

DIRECT POSTERIOR COMPOSITE RESIN RESTORATIONS

Composite resin restorations are currently used in 50% of all posterior direct restorations.[30] This popularity is increasing despite ongoing concerns about abrasion,[26,31] marginal leakage,[32] postoperative sensitivity,[33] and toxicity.[34-37] The ability to mimic the tooth color through anatomical stratification and proper placement of tints and opaquers has further enhanced the esthetic value of the direct posterior composite resin-bonded restoration.[38] Moreover, increased particle size results in lower amounts of color change due to a decrease in proportion of organic filler matrix, resulting in a decrease in rate of fluid absorption.[39] Color matching was also enhanced with polishing wheels followed by an unfilled resin glaze, rather than only wheels or/and discs.[39] While some studies report similar survival rates for composite resin and amalgam restorations after 10 years,[36,37] others do not.[26,40] In contrast to amalgam restorations, long-term success of direct posterior composites may hinge on patient selection, cavity location and size, material choice, and meticulous operative technique.[41,42] Early risk of failure is attributed to bulk fracture and partial loss of restorative material.[43]

Typical wear rates for posterior composite resin materials are between 7 to 12 μm/year and 0.1 to 0.2 mm more than enamel over 10 years.[26] However, the resin matrix and filler particles of composite resins do not abrade to the same degree.[39] Nanocomposite resins with higher filler content and smaller particle size are smoother than the hybrid composite resins and show reduced wear.[44] Accelerated attrition has been found on direct posterior Class II composite resin restorations in the occlusal contact areas in bruxers, making bruxers poor candidates for posterior composite resin restorations.[45,46] Also, patients who consume large amounts of hot coffee, carbonated beverages, or alcohol may be at risk of increased wear.[47]

Moderate to severe leakage has been demonstrated at the cervical margin located in dentin of direct Class II composite restorations, irrespective of incremental addition and etching techniques.[48-51] New dentin bonding agents have enhanced marginal adaptation, but a perfect marginal seal is still not achievable.[45,52-54] Furthermore, phase separation due to excess moisture from crevicular fluid has been shown to result in a weak, porous hybrid layer.[3] Caries-affected dentin may demonstrate a weaker adhesive bond than noncarious dentin.[4] Proximal amalgam and gold inlay restorations showed lower periodontal index scores at the marginal gingiva than composite resin restorations, and smoking status was found to be significant only with the resin-based material.[55] Light polymerized composite resin materials containing triethylene glycol dimethacrylate (TEGDMA) to decrease viscosity have also been shown to accumulate significantly more *Streptococcus mutans* than amalgam restorations.[56-58] Elutable substances such as TEGDMA and formaldehyde may be released in the oral cavity and have demonstrated cytotoxic effects causing lichenoid or allergic reactions, questioning their universal biocompatibility.[35] Additionally, a direct relationship between fluoride releasing composite resin materials and caries inhibition has not been demonstrated in vivo.[59] Therefore, composite resin restorations prepared in cervical dentin are contraindicated for patients with a high caries index, poor oral hygiene, or history of smoking.

Premolars generally offer more favorable conditions for composite resin restorations than molars.[60-62] Composite resin materials also should not be used for cuspal coverage or for large restorations exceeding one third the buccolingual width of the tooth structure.[26] Microtensile bond strength to dentin appears to decrease with increasing cavity configuration factor (C-factor).[33] The C-factor is related to the preparation geometry and is represented by the ratio of bonded to nonbonded surface areas. Residual polymerization stress increases directly with this ratio.[63] For example, the Class V preparation, due to its box shape and number of bonded surfaces compared to 1 free surface, may demonstrate increased contraction stresses resulting in significant microleakage, regardless of bonding technique[63] or type of composite resin.[64] Also, abfraction lesions with sclerotic dentin have been shown to contain a hypermineralized surface and resist etching action, compromising hybridization and bond strength.[65]

Microhybrid and nanohybrid composite resins offer improved strength, handling, and polishability for posterior restorations.[41] Nanofill composite resins, with fillers of sub-100 nanometers throughout the resin matrix, may maintain strength and also preserve the initial gloss by eliminating loss of larger particles over time.[66] These newer composite resins have the potential to be the first universal material for anterior, posterior, and cervical restorations, but will require further clinical studies.[41] Packable hybrid resin-based composites, loaded in excess of 80% of irregular sized particles,[67] have been purported to mimic amalgam handling and minimize open contacts.[68] However, other studies of packable resin-based composites have reported few advantages when compared to correctly handled previous conventional posterior resin-based composites and total etch systems.[32,69] Despite advances in bonding[50] and composite resin materials,[41] posterior composite resins remain highly technique sensitive.

When compared to similar amalgam restorations, placing composite resin restorations takes approximately 2.5 times longer because of complex sequential procedures.[70] Techniques for long-term success include dry field isolation to prevent salivary protein contamination,[71,72] specialized matrix systems,[42] dentin and enamel bonding,[73] incremental insertion to reduce gap formation and postoperative sensitivity,[74] minimizing excess final contour,[75] use of appropriate light polymerization method,[76-78] as well as meticulous finishing and polishing.[79] Because of the demanding procedures and inferior physical properties of direct composite resin restorations, compared to amalgam they are best considered when the patient's esthetic demands are high and only conservative preparations are required.

INDIRECT COMPOSITE RESINS

Indirect composite resin inlays and onlay restorations may be polymerized with light, heat, and/or pressure outside the oral environment, and luted to the tooth with a compatible resin cement.[26] The aim of this process is to overcome some of the limitations of direct composite resin restorations, especially in larger Class II preparations. Improved control of the marginal fit, proximal contacts, anatomic form, color matching, polymerization shrinkage, access, and wear resistance may be facilitated.[80] In addition, an indirect technique may reduce the potential neurotoxic effects of direct composite resin restorations related to incomplete polymerization of greater than a 2-mm incremental addition.[81] However, the superiority of indirect composite resin restorations in marginal adaptation and wear resistance remains controversial.[82,83] Kuijs et al[84] also reported that the direct and indirect cusp-replacing composite resin restorations provided comparable results for occlusal and proximal contacts, postoperative sensitivity, and color. Furthermore, 2 prospective clinical studies with a follow-up of at least 10 years showed a similar rate of failure of 16% to 20% between directly and indirectly placed composite resin restorations due mainly to fracture or secondary caries.[85,86] Higher failure rates in molars were documented with indirect composite resin restorations when the isthmus was greater than two thirds of the intercuspal distance.[87]

CERAMIC INLAYS AND ONLAYS

A recent study evaluating clinical performance of bonded leucite-reinforced glass ceramic inlays and onlays after 8 years reported an 8% failure rate due primarily to fracture. Neither cusp coverage, extensive defects in molar regions, nor preparations below the cementoenamel junction were limiting factors for success.[88] Similar results and survival rates were found with other studies of ceramic inlays and onlays using comparable material.[89-91] However, increasing marginal deficiencies, likely due to inadequate polishing after occlusal adjustment, have been noted in most intact restorations on follow-up examination.[88,92] Also, color mismatch increased significantly between ceramic inlay and tooth structure with different ceramic systems over both a 3- and 5-year observation period.[93,94] The quality of color match decreasing over time may be attributed to occlusal adjustment of surface colorants in the ceramic restoration or choice of luting composite.[95] Ceramic inlays and onlays also require close attention to patient selection and technique to afford long-term predictability. Patients with bruxism, poor oral hygiene, opposing teeth with composite resin restorations, and teeth having insufficient structure for bonding or requiring significant color changes are not optimal candidates for ceramic inlays and onlays.[96,97] Aberg et al[98] reported that 63.6% of fractured ceramic inlays occurred in patients with signs of active bruxism.

The use of feldspathic ceramic reinforced with leucite, lithium disilicate, aluminum oxide, or zirconium have improved fracture resistance[26] but the clinical success of this class of restorations depends on a precise cementation process which varies according to the ceramic material.[99] For example, silane efficiency and hydrofluoric acid chemical conditioning is compromised in ceramic systems highly reinforced with alumina and lacking in silica.[100-102] An alternative is to use phosphate-monomer containing composite resin cements which seem to provide durable resin bonds to airborne particle abraded, glass-infiltrated aluminum oxide ceramics and glass infiltrated zirconium oxide ceramics.[103,104] The biocompatibility of feldspathic, pressable lithium disilicate and leucite-based ceramic materials has been researched in vitro, and all the specimens except 1 of the lithium disilicate specimens caused only a mild suppression of cell function.[105]

The CEREC system is a chair-side application of CAD/CAM technology for restorative dentistry with follow-up clinical data reported up to 18 years.[106] The ability to produce porcelain inlays/onlays as well as crowns in a single appointment maximizes efficiency and reduces the risk of contamination during the provisional phase. The long-term failure rate of porcelain inlays made with the CEREC technique has been reported to be low.[46,106-109] Of the 8% failure incidence reported for ceramic inlays after 10 years of clinical service,[108] fracture was the most significant finding, consistent with other studies.[110,111] Marginal adaptation has not been well documented over the long term. However, studies have disclosed marginal discrepancies in 40% of the restorations after 3 years,[112,113] and 74% of the restorations at the 10-year recall examination.[114] Increase in marginal discontinuity was caused by apparent wear of the composite resin luting agent, but ditching has not been associated with significant incidence of caries in long-term studies.[107,114] Color matching for CEREC restorations is limited due to the monochromatic nature of mill blocks, although Fasbinder et al[112] reported no differences in esthetic results when compared to other conventional porcelain systems. Furthermore, multishaded, machinable monoblock systems did not improve the esthetic appearance compared to the single-shade block systems with extrinsic stain.[115] Ceramic inlays that have been luted with chemically polymerized cement have shown a greater resistance to fracture than those luted with dual-polymerizing cements in a longitudinal study.[107] Insufficient amounts of auto-polymerizing chemicals incorporated in the dual-polymerized resin cement may cause inadequate polymerization in areas that are inaccessible to the polymerization light.[116] The use of CAD/CAM system for restoring teeth with extensive coronal destruction has been evaluated. Notwithstanding, the extent of remaining enamel at the cavity margin or lack of rubber dam application, extensive onlays, and even crowns achieved a high success rate, but only over 3 years.[117] All ceramic inlay and onlay systems have a lower success rate when compared to a 40-year survival of 94.1% of gold intracoronal and extracoronal restorations,[118] which alters their risk/benefit assessment.

PORCELAIN LAMINATE VENEERS

Several clinical studies have reported the esthetic performance, biocompatibility, and durability of porcelain laminate veneers over a period of more than 9 years.[119-122] The incidence of irreparable failure was 7% or less in all of these longitudinal studies. However, the need for intervention without replacement was reported to be as high as 36%, after 10 years.[122] Overall, the primary modes of failure were noted to be fracture, microleakage, or debonding.

The predisposing factors for the occurrence of fractures were partial adhesion to a dentin surface,[123] presence of large composite resin restorations,[124] bonding to endodontically treated teeth with large defects,[125,126] and heavy functional or parafunctional loading.[127,128] Aside from careful patient selection, a controlled and uniform tooth reduction with palatal mini-chamfer or butt joint,[129] a minimal thickness of luting composite not to exceed a 1:3 ratio to ceramic thickness,[130] and management of the antagonist contact on the maxillary natural tooth structure,[131,132] have all been shown to reduce the risk for fracture.

Microleakage has routinely been shown to be more pronounced when the preparation margin is in dentin.[122,132,133] Even when depth guides allow 0.4-0.6 mm labial reduction, dentin is often exposed in the cervical area,[134] especially in patients 50 years or older.[135] Immediate and polymerized dentin sealing[136] has been shown, under scanning electron microscopy, to improve the unbroken interface between the hybrid layer and luting composite.[137] As early as 1997, Paul and Scharer[138] proposed application of the dentin bonding agent after completion of the preparation to prevent bacterial ingress and hypersensitivity during interim treatment and improved bond strength. In addition to location of preparation margins and fit of the restoration, the type of luting composite will impact the degree of microleakage as the thermal expansion coefficient and amount of polymerization shrinkage vary among types of composite resin.[132] A luting composite resin with a high filler loading will minimize these stresses.[139] However, the viscosity of such cements is also high, and the positioning of the restoration may require delicate placement technique. Given careful attention to preparation, impression, fabrication, cementation, and finishing technique, marginal adaptation under scanning electron microscopy has been found to be excellent,[140] and no deleterious influence upon the marginal gingival health was reported over 5 years.[126] However, loss of luting resin over 12 months may create visible gaps leading to marginal discoloration.[140] Microleakage has been shown to become more apparent with age of the restoration, and caries recurrence has been linked to patients with high caries activity.[120,141,142] The composite resin/tooth interface has been shown to be the primary site of oral fluid entry.[121,143] Debonding appears to occur when 80% or more of the tooth substrate is dentin and is highly unlikely when a minimum of 0.5 mm of enamel remains peripherally.[121]

Regardless of the percentage of intact layer of enamel, debonding may occur if there is contamination during the luting process. Compatibility problems between different types of simplified-step acidic adhesive systems and auto- or dual-polymerized composite resins have also been shown to result in permeability and compromise of bond.[144,145] The resulting acid-base reaction between adhesive and composite resin may prevent proper polymerization of the latter and the coupling between them.[146]

Reliable color matching with porcelain laminate veneers has not been shown to be dependent on the percentage of translucent porcelain.[147] In addition, various opaquing methods have been effective for masking the substrate tooth shade, including tetracycline-stained teeth, with no difference in debond rates.[148] However, aggressive reduction of labial enamel to provide additional restorative space for masking, risks extensive dentin exposure, and the preparation may require auxiliary retentive features before cementation of the porcelain laminate veneer.[148]

The overuse of porcelain laminate veneers has been addressed by a number of authors.[149-151] Restorative solutions for severely overlapping teeth may have a detrimental impact on pulpal health, incisal edge contour, or emergence profile.[149] Also, as teeth overlap, the contact points move apically and tooth preparation may violate the biologic width.[152] Patients presenting with multiple diastemata between normal sized teeth and restored with porcelain laminate veneers may be relegated to unnaturally wide restorations. The question remains, are structural compromises and biologic consequences of restoratively correcting alignment acceptable?[149] Conventional orthodontics may be the most conservative, biologic, esthetic, and economic treatment for imbalances in tooth position, gingival scalloping, and occlusion.

ALL-CERAMIC CROWNS

Although metal-ceramic crowns have been documented with 94% success rates over 10 years,[153] concern regarding limitations in biocompatibility and optical qualities has prompted the use of all-ceramic crowns. Brune[154] has reported that elements from the alloy of a metal-ceramic crown in close proximity with the gingival tissue may reach high concentrations, as they are not diluted by saliva. Moreover, porcelains fired on metal frameworks often do not provide optimal distribution of reflected light.[155] Therefore, all-ceramic crowns have been extensively used in prosthodontics in recent years for their superior gingival response and esthetic quality, while achieving similar marginal accuracies when compared to traditional metal-based restorations.[156-158] Longitudinal clinical studies, spanning more than 10 years, evaluating glass ceramic crowns[155,159] and those with a densely sintered alumina core[160] have shown results similar to metal-ceramic crowns, but have demonstrated higher failure rates in the posterior region, where these restorations are prone to brittle fracture.[161] Despite discrepancies in flexural strengths of dispersion strengthened and glass ceramic crowns,[26] Burke et al,[162] in a meta-analysis, reported an annual clinical failure rate for both these systems of approximately 3%. Patient selection and technique sensitivity may be more critical with all-ceramic versus metal-ceramic restorations. Several studies of all-ceramic crowns have exclusion criteria for patients with severe parafunction, moderate gingival inflammation, high caries rates, and poor oral hygiene.[155,163,164] Furthermore, the coping design and luting system may be critical to maximize long-term success. A coping design allowing for optimal ceramic thicknesses, a thin and uniform cement layer, and reduction of the mismatch in thermal expansion of the laminate and core porcelains may decrease combined stresses for all-ceramic crowns.[161] Dentin bonding and resin cements have also been shown to enhance fracture resistance as compared to using conventional cements.[165,166]

Ongoing concerns regarding wear of the opposing enamel with all-ceramic restorations have been substantiated in the literature.[167,168] The abrasive potential of ceramic is dependent on fracture toughness, the presence of porosities, crystal size, and surface finish, but there is little understanding of wear patterns, wear occurrence, and amount of wear for a particular individual.[169] Therefore, there is less potential for aberrant wear with the use of type III gold for occlusal restorative design, which has been shown to produce less vertical height reduction on opposing enamel than ceramic materials.[170]

The use of toughened ceramics such as yttria-stabilized zirconia offers a more fracture resistant application of all-ceramic crowns to the posterior region without sacrificing esthetic qualities.[171] Zirconia ceramics have physical properties that can achieve twice the flexural strength and fracture toughness of densely sintered high purity alumina ceramics.[172,173] For example, the tensile stress acting on a crack tip initiates a phase transformation from the partially stabilized tetragonal modification of zirconia to a monoclinic phase.[174] This transformation exhibits a 4% volume expansion creating compressive stresses at the crack tip, which must be overcome by the crack in order to propagate.[175] Extensive laboratory testing to date has confirmed the strength[176-178]and marginal fit[179] of zirconia ceramic, but 5- to 10-year clinical studies are lacking on the success rate and primary mode of failure.

Depending on the quantity, size, and chemical properties of the crystals within the ceramic matrix, light is more or less scattered and reflected causing the ceramic to look more opaque or translucent.[180] In-ceram Zirconia (VITA Zahnfabrik, Bad Sackingen, Germany) followed by In-Ceram Alumina (VITA Zahnfabrik), Procera AllCeram (Nobel Biocare AB, Gothenburg, Sweden), IPS Empress 2 (Ivoclar Vivadent, Amherst, NY), and In-Ceram Spinell (VITA Zahnfabrik) have been shown to have increasing translucency, which may influence the esthetic choice of restorative materials.[181,182]

ALL-CERAMIC FIXED PARTIAL DENTURES

Long-term clinical data on the success of all-ceramic systems for fixed partial dentures (FPD) are rare. Olsson et al[183] completed a 10-year study on anterior and posterior glass-infiltrated alumina FPDs cemented with zinc phosphate cement and reported a cumulative survival rate of 83%. Three to 5-year follow-up studies on glass infiltrated alumina FPDs have shown a survival of 88%-90%.[184,185] These results are less favorable compared to metal-ceramic FPDs with survival rates of 95%,[186] 90%,[187] and 85%,[188] at 5, 10, and 15 years, respectively. While success has been more promising with 35% partially stabilized zirconia,[189] the opaque core precludes its use for the anterior sextant.[182] Yttrium tetragonal zirconia polycrystal-based materials offer the most versatility because of their mechanical,[190] esthetic,[191] biocompatible,[192] and metal-like radiopaque[171] properties, although only short term data are available.[193] Furthermore, an emphasis on careful patient selection and operating technique appears to be paramount for success. The system is questionable for bruxers, periodontally involved teeth exhibiting increased mobility, and cantilever prostheses.[191] The primary mode of failure is fracture, usually located in the area between the retainer and pontic, emanating from the gingival surface of the connectors under high tensile stress, resulting in catastrophic loss.[194,195] An in vitro test evaluating moduli of rupture with a 3-point bending test suggests that placing zirconium on the intaglio surface of the pontic and connector area instead of veneering porcelain may increase the load bearing capacity of the FPD up to 10 times.[196] A minimum connector girth of 9 mm^2 has been recommended for 3-unit FPDs.[197] Longer span FPDs are experimental and have only been evaluated in vitro.[190] Smooth, uniform reduction with a deep chamfer margin and no undercuts allow accurate scanning. Laser scanners and touch-probe scanners have been shown to be comparable in digitalization of preparations.[198] A framework design allowing for a uniform thickness and support of veneering porcelain has been shown to optimize the strength of bilayered specimens.[199] Frameworks may be evaluated with a light layer of silicone disclosing material and adjustments are best made to the preparation. Intaglio wall adjustments with a 50 micron or coarser diamond rotary cutting instrument, dry or under water cooling, have been shown to generate radial surface cracks, compromising the strength of the zirconia core.[178] Marginal fit has been shown to be similar to metal-ceramic restorations.[200] Cementation of zirconia-based FPDs with either composite resin, glass ionomer, or resin-modified glass ionomer cements has been suggested, although long-term clinical studies are lacking.[191,201]

SUMMARY

Despite the innovations in biocompatibility, strength, marginal adaptation, and optical qualities of dental materials, the prognosis of esthetic restorations appears to hinge predominantly on choice of material, precise technique, and patient selection. In the face of rapid technological advances, evidence-based research offers a powerful tool to dental practitioners to assess the risk/benefit calculus of various tooth-colored restorations and provide appropriate information to patients.

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Reprint requests to:
Dr Steven J. Sadowsky
19365 7th Ave #114
Poulsbo, WA 98370
Fax: 362-779-7732
E-mail: sadow333@aol.com

0022-3913/$32.00

doi:10.1016/j.prosdent.2006.09.018