

Esthetic Rehabilitation by Ceramic Restorations: Treatment to Improve Smile Deficiency

Diemah F Alhekeir¹, Rana A Alsarhan¹, Abier F Alhekeir²

¹Department of Restorative, Ministry of Health, Riyadh, Saudi Arabia, ²Riyadh Elm University, Riyadh, Saudi Arabia

Abstract

Dental stains are a major aesthetic concern for patients and may affect their confidence. The use of prosthetic treatment for providing ceramic restorations can offer esthetic solutions and predictable results for teeth affected by discoloration, especially when this is associated with surface enamel loss. This report describes the improvement in smile deficiencies for three female patients by using ceramic restorations to manage tooth discoloration due to different etiologies.

Key Words: Etiology, Smiling, Tooth discoloration

Introduction

Tooth color is one reason for patients to seek dental treatment and it has a major impact when evaluating the attractiveness of a face [1]. A charming smile can assist individuals in overcoming shyness, but dental stains may cause individuals to hide their smile; it may prevent them from speaking properly and reduce their confidence. Stains are defined as pigmented deposits on the tooth surface. It is the first-noted dental deviation that can compromise the esthetic appearance of an individual [2].

Tooth discoloration has been classified as intrinsic or extrinsic, according to its location [3]. Depending on its severity, various treatment options have been proposed [4-6], but the outcome will depend on the depth, intensity, and degree of discoloration [7]. A correct diagnosis of the etiology is important for determining the appropriate management [8]. Shallow stains can be thoroughly removed from the tooth surface by professional cleanings, such as scaling and polishing, tooth bleaching, microabrasion, as well as microabrasion. Moreover, due to excellent esthetics and color stability, ceramic restorations offer an alternative for managing complex discoloration [9,10]. Further improvement of such technology has increased success rates and patient satisfaction [11].

This report describes the improvement in smile deficiencies in three cases, by using the prosthetic approach for delivering ceramic restorations to manage tooth discoloration of different etiologies.

Case Presentations

Three female patients with excellent health were referred to the Restorative Department, due to concerns about their smile. The patients' main complaint was unsatisfactory tooth esthetics, due to discoloration, and they required immediate treatment to enhance their appearance.

Before starting with a treatment plan, comprehensive assessments and evaluations were performed. Full mouth photographs and radiographs were taken. Treatment options and material selections were discussed. Coordination among various dental specialties was decided, and the proposed comprehensive treatment was to be conducted in sequential phases. Moreover, the choices that necessitated invasive

therapy were those that could provide optimum esthetic results, with color harmony, especially when various defects were present.

All patients accepted the treatment plan and gave informed consent.

Case I: Ceramic restorations to correct intrinsic discoloration

A 49-year-old patient complained of teeth with a dark yellow color with a white line on the labial surface. She had full-coverage restorations with poor esthetics and a lack of color matching. She had a history of tooth bleaching but confirmed that she had not been satisfied with the results (*Figure 1*). Intra-oral examination revealed the presence of generalized yellowish discoloration due to aging. She presented a typical picture of dental fluorosis with opaque white lines, score 3 [12]. A black triangle was evident at the central incisors. Furthermore, teeth #15, 13, and 22 had ceramic crowns with low color homogeneity.



Figure 1. Pre-treatment photographs of case I. Altered enamel surfaces and low color homogeneity after teeth bleaching are visible.

A systematic treatment plan involving sequential phases was devised. The prosthetic phase started with splitting the existing crowns with a diamond bur. Although this technique is considered destructive, it is the most frequently used method for removing crowns over endodontically treated teeth. Additionally, it helps to save the abutments, especially if resin cement were used [13,14]. After evaluating the remaining tooth structure, it was decided to fabricate laminated veneers and ceramic crowns. A diamond bur was used for preparation (*Figure 2*).

Corresponding author: Diemah F Alhekeir, Department of Restorative, Ministry of Health, Riyadh, Saudi Arabia; E-mail: d.alhekeir@gmail.com

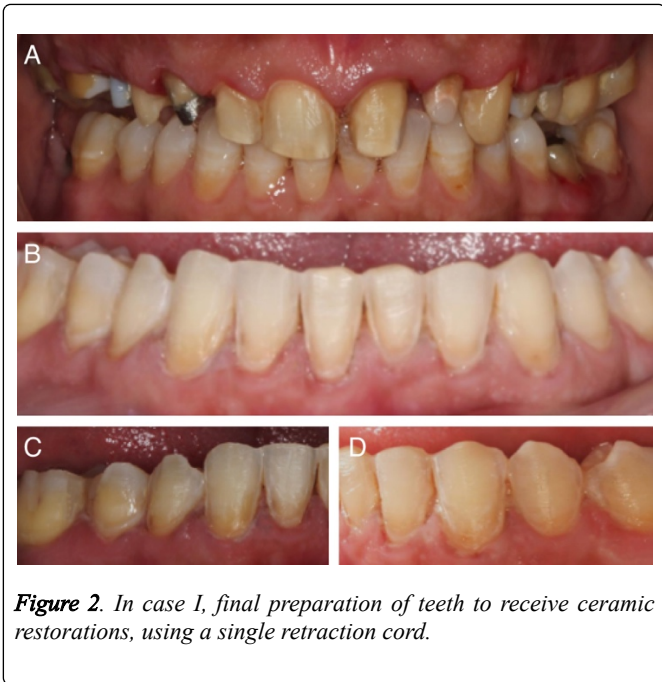


Figure 2. In case I, final preparation of teeth to receive ceramic restorations, using a single retraction cord.

Polyvinyl-siloxane impression material (Express XT, 3M ESPE, Seefeld, Germany) was used to make the final impression; the trays were loaded with heavy-bodied material, while the light-bodied material was simultaneously injected on the prepared teeth [15]. Temporary restorations were constructed using bis-acryl temporary resin (Integrity, Dentsply/Caulk, Konstanz, Germany) and were cemented with temporary cement (Temp-Bond NE, Kerr, Romulus, MI, USA). Thereafter, ceramic restorations were fabricated and checked for precision and good esthetics and phonetics.

A balanced smile and color harmony were successfully reproduced and patient satisfaction confirmed. The restorations were cemented with Relay X Unicem (3M ESPE, St. Paul, MN, USA) and Variolink Veneers (Ivoclar Vivadent, Schann, Liechtenstein) according to the manufacturer's instructions (Figure 3). Caries management by risk assessment was established as a recall program [16].

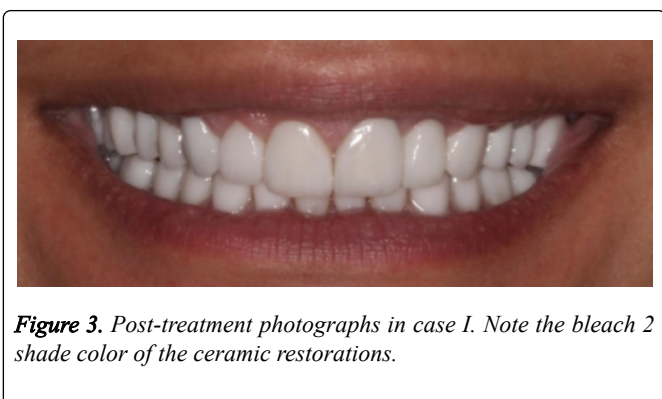


Figure 3. Post-treatment photographs in case I. Note the bleach 2 shade color of the ceramic restorations.

Case II: Ceramic restorations to correct extrinsic discoloration

A 41-year-old patient demonstrated pitted enamel with multiple discolorations in the upper anterior teeth. She also complained of discomfort related to worn anterior restorations. According to her, the staining and wearing started 8 months previously, after receiving composite

restorations. During the conversation, teeth with poor esthetics were evident, and she was neglecting her oral health. A clinical examination showed defective composite resin restorations with multiple stains, microleakage, and recurrent caries. In addition, her enamel texture was rough. Wearing facets with score 0 (no wearing into the dentin) were noticed in teeth #11, 35, 34, 33, 32, 32, 41, and 42 [17]. Furthermore, her upper premolars had received poor crowns that differed in color from the adjacent teeth (Figure 4).



Figure 4. Pre-treatment photographs in case II. Her smile was unattractive due to defective restorations and poor esthetic crowns, with lack of color matching.

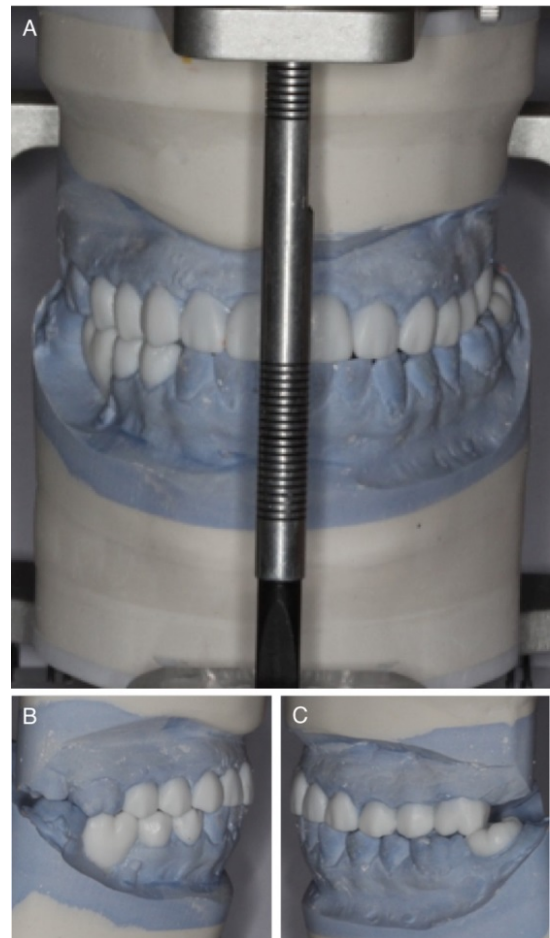


Figure 5. Diagnostic wax-up for case II mounted on a semi-adjustable articulator.

The initial appointment started with a comprehensive smile analysis, as facial and smile attractiveness are influenced by each other [18,19]. She had a low smile line with a flat incisal

curve that did not follow the lower lip. The smile width reached the second premolar and a buccal corridor was absent. Furthermore, disproportionate anterior teeth with square and ovoid shapes were observed.

Subsequently, in order to provide an aesthetically pleasing smile, it was decided to use a combination of minimally invasive therapy, such as vital teeth bleaching and porcelain laminate veneers, and invasive therapy, such as ceramic crowns, according to the remaining tooth structure. A wax-up model was presented to the patient as a three-dimension visual tool (*Figure 5*) [20].

The treatment continued with oral hygiene reinforcement and providing dental prophylaxis. Afterward, bleaching was performed using in-office bleaching with Zoom gel containing 25% hydrogen peroxide and a Zoom Light Source (Discus Dental, Culver City, CA, USA) for upper and lower teeth, according to the manufacturer's instructions (*Figure 6*).



Figure 6. A B1 shade was achieved at the mandibular anterior teeth after 2 weeks of vital bleaching. Note the slight yellowish to brown discoloration at the cervical region.

Consequently, all maxillary teeth were prepared to receive ceramic crowns, except teeth #13 and 23, which were to receive laminated veneers. The shoulder finish line and chamfer margin were placed for her crowns and veneers, respectively [21,22]. The final impression was made and temporary restorations were fabricated and cemented with non-eugenol temporary cement (Temp-Bond NE, Kerr, Romulus, MI, USA). During the final appointment, ceramic restorations were checked for any discrepancy and the color was verified. All restorations were cemented with resin cement according to the manufacturer's instructions. The patient was extremely satisfied (*Figure 7*). A recall appointment was scheduled based on her risk assessment [16].



Figure 7. A natural smile with color harmony was finally achieved in case II.

Case III: Ceramic restorations to correct combined extrinsic and intrinsic discoloration

A 22-year-old patient presented with a chief complaint of discoloration and poor esthetic restorations on her teeth. In order to improve her appearance, she had a history of multiple root canal treatments and tooth-colored restorations. In addition, bleaching had been performed. Clinical examinations revealed poor oral hygiene with multiple defective composite resin restorations. There was scattered opacity at the incisal and cuspal area. Moreover, the cervical and middle surface of the tooth was affected by mild brownish-gray discoloration, without banding (*Figure 8*).

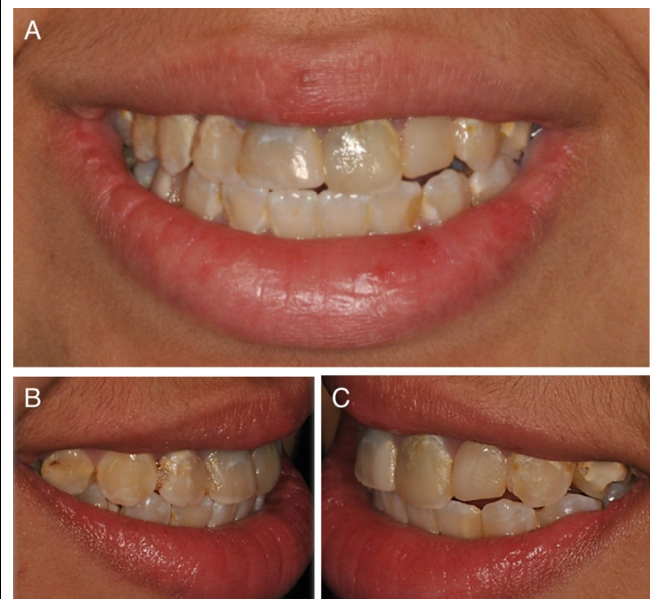


Figure 8. Pre-treatment photographs of the smile in case III. The surface is rough and composite resin restorations have failed due to marginal gaps and microleakage.

The radiographic examination showed several pronounced pathological conditions and iatrogenic injuries (*Figure 9*). We deduced that these defects were due to internalized stains caused by defective and leaking restorations [8]. Further, dental fluorosis, with a TFI scores 3, which involved all her teeth, was significantly present [12]. She had tetracycline stains, confirmed from a history of medication taken during childhood, classified as score 2 according to Boksman and Jordan [23].

A comprehensive treatment plan, involving caries control and meticulous reinforcement of oral hygiene, with strict dietary habits, was initiated. Orthodontic consultation was conducted. Although the patient had problems, such as mild crowding, edge-to-edge bite, and cross-bite in the upper anterior teeth, she refused orthodontic treatment. Moreover, the patient refused extended bleaching in the lower anterior region, as she demanded immediate esthetic results. The endodontic diagnosis was established following the AAE guidelines and root canal therapy was performed [24,25].

Discussion

Using prosthetic treatments to deliver ceramic restorations can provide esthetic solutions and predictable results for teeth affected by discoloration. As tooth color plays an important role in the attractiveness of an individual's smile, discoloration can cause a significant esthetic problem and hamper social interaction [28,29], particularly when combined with surface enamel loss. Normay stated that, in 602 patients in Saudi Arabia, 67.4% of individuals were not satisfied with the color of their teeth. Furthermore, 77.7% of these patients were willing to undergo treatments to enhance their aesthetics [30]. Teeth tend to become darker as a physiological age-related change, but any treatment that affects tooth structure will also result in discoloration. According to Watts and Addy, any changes in the coronal tooth structure will cause changes in tooth appearance, due to its light transmitting and reflecting properties [8]. Iatrogenic causes of tooth-discoloration have been confirmed in this report. This can be explained by dentists neglecting to select the precise shade in esthetic restorations, having difficulty in appropriately handling or inserting restorative material, or not understanding its biological properties. Elamin et al. found that 80% of patients were dissatisfied with color differences between their restoration and the adjacent teeth [31]. Long-term color stability of composite resin restorations can be affected by extrinsic factors, such as prolonged exposure to the oral environment [32,33]. Further, discoloration can be enhanced and cause major esthetic problems through over prescription of certain drugs, such as tetracycline, or exposure to high doses of fluoride during tooth formation. In Saudi Arabia, a high prevalence of severe fluorosis has been reported in villages dependent on local wells for drinking water [34]. Although conservative treatment options can markedly improve intrinsic stains, these tend to result in short-term patient satisfaction when the discoloration has a complex etiology.

Conclusion

The use of prosthetic treatment for delivering ceramic restoration can restore a flawless smile. Dental practitioners need to have knowledge of material science and the related disadvantages before developing a treatment plan. Understanding the concept of color selection is essential to achieving esthetic results. The negative consequences of tooth discoloration can be avoided if a dentist understands the patient's expectations, pays careful attention to details, and can predict and manage complications.

Acknowledgment

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Figure 9. Preapical radiograph of the anterior teeth in case III, showing several periapical regions of radiolucency, failed root canal treatment, and iatrogenic injuries, such as overextended gutta-percha and defective restorations.

It was proposed that all teeth with compromised clinical crowns would receive post and core treatment, to reinforce the remaining tooth structure and prevent it from detaching from the remaining dentin [26,27]. Afterward, ceramic restorations were prepared and included all darkened teeth that interfered with the buccal corridor. All margins were placed subgingivally, and retraction cord (Ultrapack #0, Ultradent, South Jordan, UT), impregnated with a hemostatic solution (Hemodent, Ultradent), was inserted carefully into the gingival sulcus. The final impression was obtained using well-designed customized trays and two-stage impression material (Express XT, 3M ESPE, Seefeld, Germany) [15]. Temporization was fabricated according to the wax-up and was cemented in place. In addition, ceramic crowns and veneers were constructed. All restorations were checked for fit, form, and color on a master cast as well as intraorally. The patient accepted the results and restorations were then cemented using resin cement according to the manufacturer's guidelines. To facilitate the finishing procedure, a micro-brush was used to remove excess cement prior to polymerization. Light polymerization was performed with a light-emitting diode curing unit (Radii-cal SDI, Bayswater, Victoria, Australia) on each tooth surface for 20 seconds. The remaining hard cement was removed using blade #12 (Figure 10). Post-operative care and instructions were given, and follow-up treatment was scheduled for every 3-4 months [16].



Figure 10. Post-operative photograph of case III.

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