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Camouflaging A Darkened Substrate with Composite Resin - Case Report

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Abstract

Today, the pursuit of beauty is not limited to external features. There has been a considerable focus on dental aesthetics, with a large number of individuals aspiring to perfectly beautiful smiles. The aim of this article is to understand the effectiveness of opacifying pigments and composite resins as a direct form of restoration in concealing discolored dental substrates. To achieve this objective, a case study was conducted with a 45-year-old female patient who sought care at Clínica Santa Bárbara due to dissatisfaction with the appearance of her teeth, which were discolored. After a thorough examination, the most appropriate and cost-effective treatment plan to achieve the desired result was determined. Ultimately, the patient's crown was replaced with an opaque one on the central incisor (Tooth 11), resulting in a restored and harmonious aesthetic that improved her quality of life. One of the greatest challenges in creating direct veneers on discolored teeth involves concealing the modified substrate. To combat the undesirable outcome of tooth discoloration, dental professionals have two options: increase tooth wear or take a more conservative approach with opacifiers. Opacifiers are defined as resins that can block light transmission and hide unwanted color on the surface of teeth. Overall, an accurate diagnosis of tooth discoloration, as well as experience in handling and knowledge of opacifying agents, are crucial to achieving a natural-looking smile and successful treatment with direct veneers on anterior teeth. The use of opacifying resins is a complementary technique to direct veneers on discolored teeth and has shown promising results.

Nowadays, the search for beauty is not limited to external characteristics alone. There has been a considerable focus on dental aesthetics, with a large number of individuals aspiring to perfectly beautiful smiles. The aim of this article is to understand the effectiveness of opacifying pigments and composite resins as a direct form of restoration in concealing darkened dental substrates. To achieve this objective, a case study was carried out with a 45-year-old female patient who sought care at the Santa Bárbara Clinic due to dissatisfaction with the appearance of her teeth, which were discolored. After carrying out a thorough examination, the most appropriate and economical treatment plan to achieve the desired result was determined. Finally, the patient's crown was replaced by an opaque one on the central incisor (Tooth 11), resulting in a restored and harmonious aesthetic that improved her quality of life. One of the biggest challenges in creating direct veneers on discolored teeth involves hiding the modified substrate. To combat the undesirable result of tooth darkening, dental professionals have two options: increase tooth wear or take a more conservative approach with opacifiers. Opacifiers are defined as resins that can block light transmission and hide unwanted colors on the tooth surface. Overall, an accurate diagnosis of tooth discoloration, as well as experience in handling and knowledge of opacifying agents, are crucial to achieving a natural-looking smile and successful treatment with direct veneers on front teeth. The use of opacifying resins is a complementary technique for direct veneers on darkened teeth and presents promising results.

Keywords: Masking. Resin. Dark substrate. Aesthetic Dentistry.

Introduction

Currently, the search for beauty is not limited to external characteristics. There has been a considerable focus on dental aesthetics, with a large number of individuals aspiring to perfectly beautiful smiles.

In this context, there is also the need to mask darkened dental foundations, whether in cases where the teeth present stains or darkening caused by extrinsic factors, such as the existence of restorative materials or intracanal fillings, or intrinsic factors, such as inadequate tooth formation, internal bleeding, pulp tissue caries or certain medications [1].

Thus, among the various treatments available, one involves the use of direct restoration with composite resin with opacifiers. The objective of this treatment is to hide the unsightly substrate, thus facilitating an aesthetically pleasing restoration, in addition to combining it with the adjacent teeth, while maintaining the aesthetic and functional balance of the entire set [2]. This artistic approach to the healthy ensures a pleasant and uniform result [23]. However, according to Costa et al. (2020), most composite resins have a notable degree of translucency, making it impossible to completely hide extremely dark surfaces. Using more opaque and high-value resins does not always guarantee complete coverage. Another considerable issue involves the use of pigments with opaque properties and dense fluid resins, which can obstruct the penetration of light and obscure undesirable shades. In addition, these substances can be responsible for considerable outbreaks in the composite resin in tiny layers [4]. Therefore, achieving a deep level of obscurity in the design of dental structures represents a considerable obstacle due to the challenge of hiding it, as shown by [5]. To this end, one of the available treatments involves the use of composite resin for direct restoration, associated with opacifiers to hide the unsatisfactory base material. In this way, it is possible to achieve an aesthetically pleasing restoration [6].

This work aims to offer a safe alternative for masking darkened foundations, as well as to elucidate the effectiveness of composite resins as a direct form of restoration in hiding darkened substrates.

Literature Review

The need for aesthetic smile corrections. Achieving a symmetrical and pleasing smile depends on multiple factors, including the attributes of the teeth themselves and the tissues surrounding them. One of these factors is the proper shape of the gum line, as noted by [7]. Thus, individuals typically desire to have teeth that appear visually pleasing so that they can communicate and express themselves with confidence, without worrying about any type of stain or mark that could lead to social stigma [8]. People generally aspire to blend in and fit in with others, rather than stand out in a negative way, and seek to achieve a sense of aesthetic harmony and beauty [9].

The main goal of aesthetic dentistry is to eliminate any visual discrepancies that may result in unattractive effects. This is achieved through the application of certain unifying principles, such as proportionality, symmetry and dominance [10].

In this way, a person's teeth are closely linked to their general well-being, including their health and personality. A smile has the ability to communicate a wide range of emotions and feelings [11].

In this context, Kansow et al. report that as a result, there is a growing demand in the field of dentistry for the search for the perfect smile through aesthetic corrections, leading them to search for more refined techniques and methods to achieve the aesthetic results desired by patients [12, 13].

As the demand for aesthetic dentistry continues to grow, the techniques and technologies employed to achieve superior results are constantly evolving. As a result, there is a persistent effort to explore new materials and equipment, as well as processes, that will lead to greater patient satisfaction, minimizing risks and negative consequences.

The Use of Composite Resin in Dentistry

Recent developments in dentistry, mainly in the search for aesthetic improvements and less invasive procedures, have led to composite resin receiving widespread attention in the last ten years [14]. This material has been the subject of intense research focused on improving some of its unfavorable characteristics [15].

Currently, composite resin is the most widely used substance in the field of aesthetic restorations [16].

These materials are produced by mixing an organic matrix with inorganic particles and wrapping them in a binding agent (silane).

[...] Low viscosity monomers, such as TEGDMA (triethylene glycol dimethacrylate) and EDGMA (ethylene glycol dimethacrylate) are incorporated into the mixture to reduce the thickness of the organic matrix [17].

This facilitates handling and implantation in the cavity as needed (BERGAMIN et al., 2010).

Composite resins are widely used in aesthetic dental procedures due to their ability to imitate the opacities, colors and translucency of enamel and dentin [18].

Since their introduction into the field of dentistry in the 1950s, the development of composite resins has been of great importance. Numerous studies have been carried out to improve this methodology, resulting in the creation of several types of composite resins, each with unique applications depending on the treatment required [19].

According to Fernandes et al., composite resins are used for various purposes in dentistry, including, but not limited to, direct and indirect restorations, fissure sealants, cavity lining, provisional restorations, crowns, cement for prosthetics and orthodontic appliances, and endodontic cements ‘[19].

Recent advances in the composition of composite resins have focused on reducing particle size to create materials with excellent mechanical strength and finishing capabilities (POLLI et al., 2014). These modifications have also aimed to improve surface gloss. However, current changes are mainly directed at the polymer matrix of the material [20]. The goal is to develop polymers that present minimal polymerization shrinkage, which would avoid deformation of the cusps, sensitivity, microcracks, adhesive failures, secondary cavities, and infiltrations. Furthermore, these polymers must be self-adhesive to the dental structures (FRONZA et al., 2015).

Regarding polymerization shrinkage, Caneppele; Bresciani (2016) state that it represents one of the main restrictions of composite resins. This leads to the emergence of tension forces at the interface between the tooth and the restoration.

According to Silva et al. (2017), the insertion of composite resin in stages helps to reduce the amount of material that retracts on the surface, thus reducing the overall tension within the cavity.

Thus, new techniques and procedures have emerged to make restoration a safe and successful procedure with increasingly natural effects.

The Use of Opacifiers and Mimicry in Dentistry

According to Felippe et al., opacifiers are used for two main purposes. The first is to camouflage dark axial walls, while the second is to imbue the restoration with discreet tones [21].

According to research by Cardoso, opacifying resins have significant value and can act as substitutes for thick layers of composite resins when used in thin layers [22]. This conservative technique, used in direct techniques, not only reduces tooth wear, but also safeguards the integrity of healthy tooth structure.

In this context, Calixto; Massing stated that obtaining a natural-looking smile requires in-depth knowledge and proficiency in the use of opacifying agents [23].

Thus, to achieve natural-looking aesthetics and successful treatment with direct veneers for anterior teeth, it is crucial to have experience in handling and a comprehensive understanding of opacifying agents [24].

Therefore, to solve the problem of a tooth with a discolored dental base, the use of opacifiers is suggested. These opacifiers are usually fluid or regular consistency resins, constructed from dimethacrylate (BIS-GMA) and usually photocurable (SILVA et al., 2017). They have the ability to obstruct light transmission and obscure unwanted shades within the tooth. Despite their high cost, these resins can replace thick layers of composite resin and efficiently hide the discolored background even in thin layers [25].

Opacifiers are used for concealment, similar to the way mimicry is used in oral rehabilitation. Both methods are used to hide prosthetic components between natural teeth, with opacifiers acting as camouflage and mimicry, imitating the original teeth [26].

The term “biomimetic” in Biomimetic Dentistry is derived from the Greek language, where “bios” means “life” and “mimetikos” means “imitative”. Its etymology establishes principles and concepts that prioritize the preservation of natural tooth structure, including stress reduction and adhesion maximization protocols, where modern adhesive systems are used to maintain the integrity and integrity of dental tissues [12]. The objective of this approach is to restore tooth function, strength and aesthetics [27].

Thus, the philosophy of biomimetic dentistry is centered on the concept of dental restoration through the imitation of natural processes, using adhesive techniques (GIANNINI et al., 2008). In this context, LIN et al., elucidate that this approach prioritizes the preservation of a greater portion of the tooth structure, while ensuring strong adhesion and a prolonged service life for both the tooth and the restoration [18]. As stated by Tekce et al., these principles are essential for successful biomimetic dental procedures [20].

Biomimicry is a field that aims to create artificial materials that reproduce the natural world through artificial mechanisms. This is done by examining the structure, formation and functionality of substances and materials produced in biological systems (POLLI et al., 2014). The fundamental principle of biomimicry is to restore the full range of functions of dental tissues through the integration of hard tissues. This process results in functional tension that ensures that the entire dental crown achieves biological and esthetic functionality, as explained by [28]. The goal of biomimetics is to ensure the durability of your restorations, preserving their anatomy, original structure and any other modifications.

Case Report

45-year-old female patient came to a private clinic reporting dissatisfaction with her dental aesthetics and darkening of her teeth, leading to dissatisfaction with her smile - figure 1. Upon performing an anamnesis, it was found that the patient, in general, had good dental health.

During the clinical examination, it was found that tooth 11, the upper right central incisor, had a darkened substrate, evidencing the patient's main complaint - darkened tooth in the cervical region - and a different color between the other teeth, as shown in figure 1.

Figure 1: Presentation of the patient's initial situation.
Source: own authorship

A more in-depth analysis revealed the presence of an unsatisfactory and visually unattractive crown due to the darkening caused by the metal pin in element 11.

Based on the results of the examination, the best treatment to follow was determined that would produce the desired result and fit within the patient's budget. Thus, the replacement of the porcelain crowns and other ceramic laminates was planned and carried out, with the aim of achieving a harmonious aesthetic that would effectively restore the patient's smile.

After completing the entire process of anamnesis, analysis and verification of the best treatment to follow for the patient, the porcelain crown was removed with a Lite Touch laser – Figure 2. In addition, we reduced the metal pin so that it did not exceed the limits of the plan.

Figure 2: Presentation of the situation after removal of the porcelain crown with a LiteTouch laser.
Source: own authorship

The metal post was then polished - Figure 3. The metal substrate was then covered with IPS Empress Direct pigment and Ivoclair Vivadent opacifier in the cervical region - Figure 3.1. This ensured that the color of the post perfectly matched that of the resin.

Figure 3 and 3.1: Presentation of the situation after polishing the metal post and Presentation of the situation after coverage with IPS Empress Direct pigment and Ivoclair Vivadent opacifier
Source: own authorship

In element 11, the metal post was covered after relative isolation, acid etching for 30 seconds on metal with 10% hydrofluoric acid (Condac 10%, FGM, Joinville, SC, Brazil) and rinsing for 60 seconds, always protecting the neighboring teeth. Application of silane (Prosil, FGM, Joinville, SC, Brazil)

The adhesive system (Adper Single Bond 2 - 3M, São José do Rio Preto, SP Brazil) was applied and photoactivated (Valo photopolymerizer) for 20 seconds. Next, the polyester guide (TDV - Polyethylene terephthalate - Figure 3.2) was previously cut and placed in position with increments of OA2 opaque resin (Z350, 3M ESPE, São José do Rio Preto, SP, Brazil), B1 enamel (Empress direct) and 00 Ultrapak retraction cord - Figure 3.3, starting the coating, photoactivated for 20 seconds, reproducing the primary anatomy of the element - Figure 3.4. Under the last layer, KY water-soluble gel (Semina Indústria e Comércio Ltda., São Paulo, SP, Brazil) was placed to block the oxygen, allowing complete photopolymerization of the composite resin - Figure 3.5.

The incisal reduction and extension to the palatal surface of the tooth consisted of removing all excess, maintaining the end in the shape of a rounded shoulder.

Figuras 3.2; 3.3; 3.4 e 3.5: confecao da coroa sobre pino em resina composta , com uso da matriz TDV, e preparos coronários.
Source: own authorship

After the preparations were made for this element, the molding was performed with the gingival retraction using the number 00 Ultrapak retraction cord.

Once this was done, the preparations and molding to receive the new ceramic veneers began. Initially, molding was performed with alginate and the plaster model was made for planning and diagnostic waxing. Then, the plaster model, already waxed, was molded with heavy silicone and activator (Optosil® Comfort Putty, Hanau, Germany) and addition silicone, using the double molding technique, Figure 4. The silicone guide was placed in position in the oral cavity to check for correct adaptation and removal of excess with a 12 C scalpel blade (Solidor, Osasco, São Paulo, SP, Brazil) and then removed.

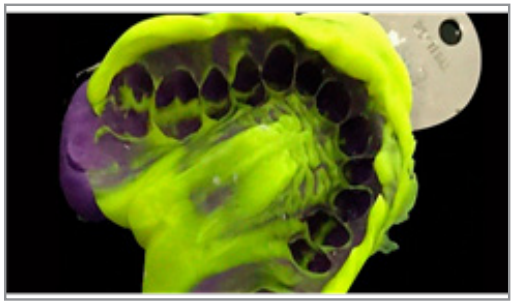

Figure 4: Double molding technique with heavy and addition silicone
Source: own authorship

Figure 4.1: 3M protemp bisacrylic blench resin, and provisionals made and installed
Source: own authorship

The provisional was made according to the previous waxing, using the silicone guide (Express™ XT 3M) with 3M protemp bisacrylic blench resin - Figure 4.1.

Figure 5: After the 21-day period
Source: own authorship

The dental substrate was hybridized and the resin cement was inserted into the internal surface of the restorations that were positioned. After careful removal of excess cement using a microbrush and dental floss in the interproximal regions of the teeth, photoactivation was performed with an LED unit (Valo) for 60 seconds on each tooth, 30 on the vestibular surface and 30 on the palatal surface. Excess cement was removed from the cervical region with a multi-bladed tip and the cement-ceramic interface was polished with abrasive tips for composite resin. Also in the same session, increments of Z-350E nanoparticulate composite resin were made in the mesial regions of the upper canines, obtaining a satisfactory aesthetic result.

The ceramic element was made of lithium disilicate-based glass ceramic (E.max color BL4) Figure 6.

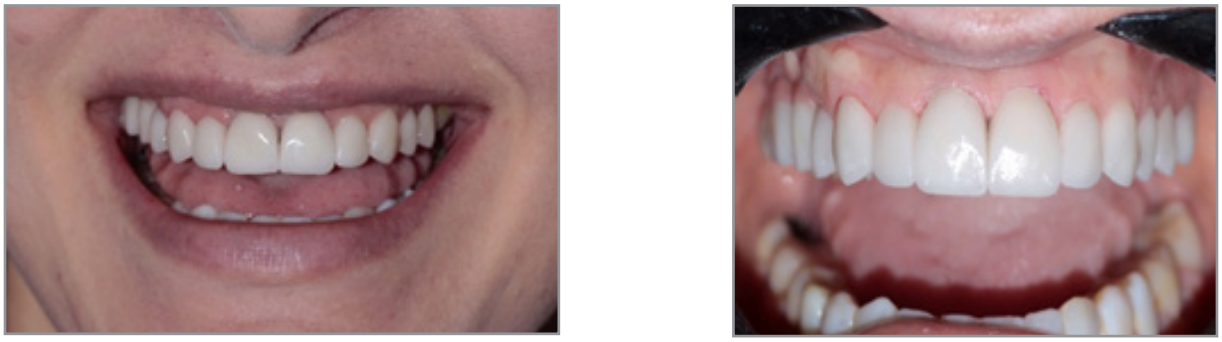

Figure 6: Ceramic laminate immediately after cementation.
Source: own authorship

Relative isolation was performed using a mouth opener, suction device and number 00 retraction wires. As a result of this process, the patient's self-esteem increased and she expressed immense satisfaction with the new color and shape of her teeth, compared to the previous work - Figure 7.

Figure 7: final result in comparison before and after..
Source: own authorship

Discussion

In the clinical situation of darkened teeth, the task of hiding the color is a considerable challenge for any professional. In this scenario, the most appropriate treatment must be determined based on a thorough analysis of the patient's dental arch.

Thus, Oliveira et al. states that in order to initiate an appropriate treatment for darkened teeth, there are several reasons that deserve careful consideration, since, depending on the case, the results may be unsatisfactory when using composite resin [25].

In this regard, research conducted by Trevisan et al. found that the use of a conservative and sufficient method of tooth preparation leads to desirable results [29]. This is due to the fact that opaque materials have a remarkable ability to increase opacity even with minimal layers, thus producing a favorable result with minimal tooth preparation and adequate contouring of the veneer.

Thus, one of the advantages of this technique is that it allows repairs to be made during the procedure, in addition to controlling the color and shape. Compared to ceramic veneers, direct composite resin veneers are easier and more effective to produce, as they do not require any laboratory work. This technique is also minimally invasive and more conservative, usually performed in a single session.

In addition, it provides excellent resistance and color stability, eliminating the need for a temporary during treatment. The final result is aesthetically pleasing and the cost/benefit ratio is favor-

able, with a shorter clinical time. It is expected to have a clinical longevity of approximately 10 years.

According to Mendonça; Reina (2018), the effectiveness of this technology is based on two fundamental factors: its visual and operational integration.

According to Cerri et al., these factors are linked to the precise understanding of the anatomy inherent to the tooth, as well as the challenge of matching the exact shade of the composite resin required for a perfect aesthetic restoration [30].

Individuals may question the ability of the human eye to discern the subtle details of natural teeth during this procedure.

In this regard, Wei Tang (2018) states that it is interesting to compare visual methods using spectrophotometry to evaluate the optical amalgam of dental restorations.

Thus, it is noted that despite some initial questions, at the end of the process, when faced with the final result, patients end up seeing for themselves that the results were in line with what they expected or better. Thus, reviving the harmony of their smile and bringing back their self-esteem [31-42].

Final Considerations

After the study was completed, it was determined that the recommended course of action, which involved replacing the old crown with a new metal crown in conjunction with the use of a metal opacifying post, produced excellent results. This approach not only restored the patient's oral functionality, but also improved her overall health and aesthetic appearance.

The patient expressed complete satisfaction with the results of this method, which was also the most practical option given her financial resources.

As a result, this method has demonstrated its effectiveness and practicality for dental professionals and their patients. It has a multitude of advantages, such as the ability to accurately predict results and reduce expenses.

References

1. dos Anjos, P. T. F. B., Teixeira, M. L. C., Vieira, E. P. A., de Castro Namorato, K. S., & de Oliveira Rocha, M. (2022). ALTERNATIVAS DE TRATAMENTOS PARA DENTES COM SUBSTRATO ESCURECIDO: REVISÃO NARRATIVA. Scientia Generalis, 3(2), 193-208.
2. Aléria do Carmo by Brito Lopes, K., Karlos Eduardo Rodrigues Lima, & Talita Arrais Daniel Mendes. (2021). Esthetic rehabilitation in tooth with dark crown discoloration caused by trauma: Case report. Scientific Journal, 10(9), 1461-1465.
3. Martins, I. O., Botelho, S. S., & Klug, R. J. (2021). Aesthetic solution: Masking in blackened tooth. Facit Business and Technology Journal, 1(29), 211-217.
4. Rodrigues, N. F., Glory, G. Y. C., Araujo, P. L., & Carlos, A. M. P. (2020). The multifactorial etiology of dental pigmentation: A literature review. Brazilian Journal of Development, 6(12), 94673-94678.
5. Queiroz, M. C. B. A., & Barreto, S. R. (2015). Direct facet as an option for restoration of blackened anterior tooth: Addressing technique (Trabalho de Conclusão de Curso, Universidade Tiradentes).
6. Vasconcelos, B. C. E., & Nillio, K. F. (2021). Two treatments for blackened teeth: A review of the literature (Artigo de Especialização, Centro Universitário São Lucas).
7. Censi, R., Vavassori, V., Borgonovo, A. E., & Re, D. (2014). Esthetic rehabilitation of a severely compromised anterior area: combined periodontal and restorative approach. Case reports in dentistry, 2014(1), 658790.
8. Moura, A. P. (2015). The use of DSD (digital smile design) for the optimization of dental esthetics (Trabalho de Conclusão de Curso, Universidade Estadual Paulista Júlio de Mesquita Filho).
9. Becerra Santos, G., Becerra Moreno, N., Jiménez Arango, M., Medina Piedrahita, V. M., Tamayo López, L. C., & Gómez, S. L. (2015). Algunos factores relacionados con la estética dental: una nueva aproximación. Revista Facultad de Odontología Universidad de Antioquia, 26(2), 271-291.
10. Gimenez, F. N. (2016). The Aesthetics of the Smile (Graduate Work, State University of London).
11. Cabral, D. G. M., & Trauth, K. G. S. (2017). In vitro evaluation of the masking technique of dark substrates with ceramic facets through refractory layering. Journal of Dentistry of the University of São Paulo, 22(1), 1-9.
12. Kanzow, P., Wiegand, A., Wilson, N. H., Lynch, C. D., & Blum, I. R. (2018). Contemporary teaching of restoration repair at dental schools in Germany–Close to universality and consistency. Journal of dentistry, 75, 121-124.
13. da Silva, E. S., Starling, M. C. V. M., & Amorim, C. C. (2023). LED-irradiated photo-Fenton process on pollutant removal: outcomes, trends, and limitations. Environmental Science and Pollution Research, 1-23.
14. Ure, D., & Harris, J. (2003). Nanotechnology in dentistry: reduction to practice. Dental update, 30(1), 10-15.
15. Haj-Ali, R., Walker, M. P., & Williams, K. (2005). Survey of general dentists regarding posterior restorations, selection criteria, and associated clinical problems. General Dentistry, 53(5), 369-375.
16. Giannini, M., Brown, B. M., & Price, R. B. T. (2008). Consensus in adhesive dentistry: Guidelines for achieving clinical success in adhesive dental structures. International Esthetic Dentistry, 3(2), 1-8.
17. Michelon, C., Hwas, A., Borges, M. F., Marchiori, J. C., & Susin, A. H. (2009). Direct composite resin restorations in posterior teeth: Current considerations and clinical application. RFO, 14(3), 256-261.
18. Lin, J., Sun, M., Zheng, Z., & Shnya, A. (2013). Effects of rotating fatigue on the mechanical properties of microhybrid and nanofiller-containing composites. Dental Materials Journal, 32(3), 476-483.
19. Fernandes, H. G. K., Silva, R., Marinho, M. A. S., Oliveira, P. O. S., Silva, R., & Ribeiro, C. R. (2014). Evolution of composite resin: Literature review. Green River Valley University Magazine, 12(2), 401-411.
20. Tekçe, N., Tuncer, S., Demirci, M., Serim, M. E., & Baydemir, C. (2015). The effect of different drinks on the color stability of different restorative materials after one month. Restorative dentistry & endodontics, 40(4), 255-261.

21. Felippe, L. A., MONTEIR Jr, S. Y. L. V. I. O., DE CALDEIRA ANDRADA, C. A., & Ritter, A. V. (2005). Clinical strategies for success in proximoincisal composite restorations. Part II: Composite application technique. Journal of Esthetic and Restorative Dentistry, 17(1), 11-21.
22. Cardoso, P. C. (2011, January). Direct facets of composite resin and tooth whitening: Strategies for darkened teeth. Revista Odontológica do Brasil Central, 20(55), 20.
23. Calisto, R., & Massing, N. (2014). Esthetic challenges: Straightforward facets in darkened teeth. Dental Journal Press Estét., 11(1), 14-25.
24. Lawrence, M. S., & Peralta, S. L. (2016). Use of opacifying pigments in dentistry: A literature review. In Scientific Exhibition of the University Course of Dentistry, 1(1), 1-2.
25. Oliveira, A. L. B. M. D., Lorenzetti, C. C., Garcia, P. P. N. S., & Giro, E. M. A. (2014). Effect of finishing and polishing on color stability of a nanofilled resin immersed in different media. Revista de Odontologia da UNESP, 43(5), 338-342.
26. Dietschi, D., Duo, O., Krejci, I., & Sadan, A. (2007). Biomechanical considerations for the restoration of endodontically treated teeth: a systematic review of the literature--Part 1. Composition and micro-and macrostructure alterations. Quintessence international, 38(9).
27. Dionysopoulos, D., & Gerasimidou, O. (2020). Biomimetic dentistry: Basic principles and protocols. ARC J Dent Sci, 5(3), 1-3.
28. Bazos, P., & Magne, P. (2011). Bio-emulation: biomimetically emulating nature utilizing a histo-anatomic approach; structural analysis. European Journal of Esthetic Dentistry, 6(1).
29. Trevisan, T. C., Gusson Jr., M., Bortolatto, J. F., Pigossi, S., Olivera Jr., O. B. D., & Ricci, W. A. (2018). Color stability of conventional and bulk fill composite resins. Gaucher Journal of Dentistry, 66, 15-20.
30. Cerri, A., Guarim, J. D. A., & Genovese, W. J. (2015). Planning and diagnosis in Dentistry with the bioethical principles. Revista da Associacao Paulista de Cirurgioes Dentistas, 69(3), 216-225.
31. Benetti, A. R., Havndrup-Pedersen, C., Honoré, D., Pedersen, M. K., & Pallesen, U. (2015). Bulk-fill resin composites: polymerization contraction, depth of cure, and gap formation. Operative dentistry, 40(2), 190-200.
32. Macedo, K. N., Castro, Y. M. N., de Castro, S. L., de Abreu Filho, A. C., & Gagliardi, R. M. (2024). Infiltração marginal em dentes restaurados com resinas de incremento único-Bulk Fill. Journal Archives of Health, 5(2), e1661-e1661.
33. Nogueira, M. F., dos Santos Guimarães, J., & Costa, M. D. (2023). Tratamento restaurador em dente posterior pela técnica semidireta: relato de caso. Brazilian Journal of Health Review, 6(4), 17596-17610.
34. Donato, T. R., Souza, L. S., Cavalcanti, A. N., & Mathias, P. (2017). Colour change in a simulation of discolored tooth using two composite resins of the same colour but different opacities.
35. Fahl Júnior, N. (2016). The direct/indirect composite resin veneers: A case report. Practical Periodontics and Aesthetic Dentistry (PPAD, 8(7), 627-640.
36. Karuna, Y. M., Srikant, N., Kundabala, M., Nayak, A. P., Rao, A., & Maimoona, T. M. (2023). Comparative Evaluation of the Color Stability and Clinical performance of bulk-filled composites: A Split-mouth Randomized Controlled Trial. Research Journal of Pharmacy and Technology, 16(11), 5091-5095.
37. Oliver, A. S., Oliver, L. E. A., Oliver, H. L., Silvera, P. V., & Peralta, S. L. (2019). Masking of darkened teeth using direct restorations: Case report. Journal of Scholarly Dialogues, 8(2), 35-41.
38. Fish, A. C., Vaez, S. C., Pereira, N. A. R., Santana, C. N. S., Soares, K. D. A., Rome, C. T. R. R., Ferreira, L. F., Martins-Filhos, P. R. S., & Faria-e-Silva, A. L. (2018). High-concentration carbamide peroxide can reduce the sensitivity caused by in-office tooth bleaching: A single-blinded randomized controlled trial. Journal of Applied Oral Science, 26, 1-10.
39. Silver, A. O., Oliver, L. E., Lacerda, H. O., Silvera, P. V., & Peralta, S. L. (Year). Masking of darkened teeth using direct restorations: A case report. Journal of Scholarly Dialogues, 8(2), 36-41.
40. Silva, B. M. H. (2019). Direct esthetic solutions in blackened teeth: Case report. Revista SDI Aura, 8-9.
41. Vivanco, R. G., Amorim, A. A., & Ferreira, A. C. (2020). COMPÓSITOS RESTAURADORES DIRETOS. MANUAL DE MATERIAIS DENTÁRIOS, 119.
42. Shahmiri, R. (2021). Characterisation and Modification of the Optical Properties of Zirconia-Based Ceramics for Aesthetic Dental Restorations (Doctoral dissertation, UNSW Sydney).