AESTHETIC REHABILITATION USING THE DOUBLE CEMENTATION TECHNIQUE TO MASK DENTAL SUBSTRATES OF DIFFERENT COLORS – CASE REPORT

REABILITAÇÃO ESTÉTICA UTILIZANDO A TÉCNICA DA DUPLA CIMENTAÇÃO PARA MASCARAR SUBSTRATOS DENTÁRIOS DE CORES DIFERENTES – RELATO DE CASO

REHABILITACIÓN ESTÉTICA UTILIZANDO LA TÉCNICA DE DOBLE CEMENTACIÓN PARA ENMASCARAR SUSTRATOS DENTALES DE DIFERENTES COLORES – REPORTE DE CASO

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ABSTRACT

Discomfort related to the color and shape of teeth has become one of the main reasons patients seek rehabilitative treatment. Therefore, it is particularly challenging when the teeth involved in this disharmony are anterior. The diagnosis of the type of stain will determine the technique that the dentist should use. The choice of material, planning, and execution criteria are extremely important for the success of the procedure. The present study aims to report a clinical case of a patient who attended a dental office in the city of Sobral, Ceará, with an aesthetic complaint. This research adopts a qualitative approach, without a control group, of a narrative nature, with a descriptive and observational purpose, based on a single clinical case sample to be studied. The bibliographic search was carried out in the PubMed, SciELO, and Google Scholar databases, related to the restorative technique for darkened teeth using ceramic veneers. The descriptors used were: “tooth whitening,” “dental trauma,” “dental porcelain,” and “endodontics.” The clinical case concerns a 35-year-old female patient, systemically healthy, who attended the dental office complaining about the color and size of her anterior teeth. After a detailed anamnesis, clinical and radiographic examinations, and the patient’s medical history, endodontic treatment was observed in tooth 11, along with coronal discoloration and disharmony in the height/width proportion of teeth 13, 12, 11, 21, 22, and 23. Subsequently, ceramic rehabilitation using lithium disilicate veneers was

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performed on these dental elements, along with a full metal-free crown and veneer on tooth 11.

Keywords: Tooth Whitening. Dental Trauma. Dental Porcelain. Endodontics.

RESUMO

O desconforto atrelado à coloração e formato dos dentes tornou-se uma das grandes procuras por tratamento reabilitador. Portanto, é desafiador, especialmente quando os dentes envolvidos nessa desarmonia são anteriores. O diagnóstico do tipo de mancha irá indicar a técnica que o cirurgião dentista deverá utilizar. A escolha do material, o planejamento e os critérios na execução são de extrema valia para o sucesso do procedimento. O presente estudo tem como objetivo relatar um caso clínico de uma paciente que compareceu ao consultório odontológico, na cidade de Sobral-Ceará, com queixa estética. Essa pesquisa apresenta uma abordagem do tipo qualitativa, sem grupo de controle de caráter narrativo, que tem finalidade descritiva e observacional, de amostra única de um caso clínico a ser estudado. As buscas bibliográficas foram realizadas nas bases de dados PubMed, SciELO, Google Acadêmico, relacionados à técnica restauradora de dentes escurecidos com facetas cerâmicas. Os descritores utilizados foram: “clareamento dentário”, “traumatismo dentário”, “porcelana dentária” e “endodontia”. O caso clínico trata-se de uma paciente do sexo feminino, 35 anos de idade, normossistêmica, que compareceu ao consultório odontológico, queixando-se da cor e do tamanho dos dentes anteriores. Após anamnese detalhada, exames clínicos, radiográficos e história pregressa da paciente, foi observado tratamento endodôntico no elemento 11, escurecimento coronário, além de desarmonia entre a proporção altura/largura dos elementos 13, 12, 11, 21, 22 e 23, e posteriormente foi realizada reabilitação cerâmica de dissilicato de lítio do tipo faceta nesses elementos dentários e coroa metal free total mais faceta no elemento 11.

Palavras-chave: Clareamento Dentário. Traumatismo Dentário. Porcelana Dentária. Endodontia.

RESUMEN

La incomodidad relacionada con el color y la forma de los dientes se ha convertido en una de las principales razones por las que los pacientes buscan tratamiento rehabilitador. Por lo tanto, resulta especialmente desafiante cuando los dientes involucrados en esta desarmonía son anteriores. El diagnóstico del tipo de mancha indicará la técnica que el odontólogo deberá utilizar. La elección del material, la planificación y los criterios de ejecución son de suma importancia para el éxito del procedimiento. El presente estudio tiene como objetivo reportar un caso clínico de una paciente que acudió a una consulta odontológica en la ciudad de Sobral, Ceará, con una queja estética. Esta investigación presenta un enfoque cualitativo, sin grupo de control, de carácter narrativo, con finalidad descriptiva y observacional, basada en una muestra única de un caso clínico a ser estudiado. La búsqueda bibliográfica se realizó en las bases de datos PubMed, SciELO y Google Académico, relacionadas con la técnica restauradora de dientes oscurecidos mediante carillas cerámicas. Los descriptores utilizados fueron: “blanqueamiento dental”, “traumatismo dental”, “porcelana dental” y “endodoncia”. El caso clínico corresponde a una paciente de sexo femenino, de 35 años, sistémicamente sana, que acudió a la consulta odontológica quejándose del color y tamaño de los dientes anteriores. Tras una anamnesis detallada, exámenes clínicos, radiográficos y la historia previa de la paciente, se observó tratamiento endodóntico en el diente 11, oscurecimiento coronario y desarmonía en la proporción altura/ancho de los dientes 13, 12, 11, 21, 22 y 23. Posteriormente, se realizó rehabilitación cerámica con carillas de disilicato de litio en estos elementos dentarios, además de una corona total libre de metal junto con carilla en el diente 11.

Palabras clave: Blanqueamiento Dental. Traumatismo Dental. Porcelana Dental. Endodoncia.

1 INTRODUCTION

Overestimating the aesthetic standards imposed by the media resulted in the search for a standard of beauty representative of professional, economic, and social success (BISPO, 2018). In this sense, it is known that dental aesthetics is directly linked to the patient's well-being and there are several ways to correct problems related to alignment, symmetry, position, texture. Among the elements that make up the aesthetics of the smile, the color of the teeth is the one that most bothers the individual (GRESNIGT; KALK; OZCAN, 2012).

Alves Rezende and Fajardo (2016) explain that progress, the circulation of new operative techniques and new dental materials have opened an important direction for aesthetics and health in the field of dentistry by both professionals and patients.

Therefore, according to today's aesthetic premises, discomfort with tooth color is, without a doubt, one of the main reasons that leads patients to seek a more harmonious smile (BARBOSA; NERES; AMARAL, 2021).

It is known that color is a complex and subjective phenomenon, which can be captured in different ways, depending on the object, source of lighting and the observer. In addition, tooth color is affected by several factors, such as enamel morphology and thickness, light, presence of pigmentation characterized by intrinsic and extrinsic factors, and the amount of dentin eventually exposed (SHEN; RAWLS; ESQUIVEL-UPSHAW, 2023).

As the tooth ages, there is a decrease in the size of the pulp chamber, a characteristic of this course, leading to the deposition of secondary dentin, modifying the color of the dental substrate to a darker tone. In addition, the association of abrasion and erosion processes causes a reduction in the amount of enamel, gradually transmuting the evident color of the underlying dentin (BEGUM et al., 2014).

Tooth pigmentations of intrinsic causes can be defined and localized, confined to the region of a single tooth element. Its causes are: trauma to developing teeth, periapical infection, trauma to the deciduous tooth, pigmentation by amalgam or inadequate endodontic treatment. In addition, they can also be generalized, dispersed throughout the crown of one or several teeth, among them are: amelogenesis imperfecta, dentinogenesis imperfecta; 12 accompanied by systemic disorders. There are also postnatal causes, such as infections, drug therapy, nutritional deficiencies, and hematopoietic diseases (BISPO, 2018).

Thinking about the correction of these types of dental stains, new materials, techniques and protocols are made available to the dental surgeon, bringing new techniques to mask unwanted substrates, resulting in restorations that appear close to the natural tooth (BASEGIO, 2018).

Tooth whitening is a technique that can be exemplified as conservative, developed to

improve the appearance of the smile through changes in dental nuances, being considered a non-invasive and low-cost method (VASCONCELOS; NILLIO, 2021).

In addition, currently, there is a diversity of ceramic systems available for both aesthetic and functional rehabilitation. However, there is no single all-ceramic system that can be used in all clinical situations (ZÜGE, 2018).

An integral adhesion between ceramic materials and the tooth structure can be obtained through adhesive cementation, which promotes mechanical integration of the system, contributing to its resistance to fracture. In addition, there was a need for improvements in adhesive dentistry and computer-aided technologies, which made it possible to describe various treatment options for the rehabilitation of anterior teeth, such as crowns, veneers, laminates, among others (GUNDOGDU; ALADAG, 2018).

However, the elevation of patients' aesthetic expectations to achieve good results in anterior teeth requires materials with optical properties similar to natural teeth, making rehabilitation more imperceptible (DANESHPOOY, 2019).

Given the above, it is presented how the analyzed clinical case will enable an aesthetic rehabilitation of darkened and heterogeneous dental substrates, using the technique of double cementation of personalized ceramic copings associated with ceramic veneers.

2 OBJECTIVES

2.1 GENERAL OBJECTIVE

OBJECTIVE: To report a clinical case of rehabilitation using the double cementation technique in anterior teeth, with the association of personalized ceramic coping and ceramic veneer, as an aesthetic solution for masking dental substrates of different colors.

2.2 SPECIFIC OBJECTIVES

a) To highlight the etiology of tooth darkening;

b) To address the main techniques for aesthetic restoration in darkened teeth;

c) Report the clinical and operative steps of the double cementation technique of ceramic custom copings

3 THEORETICAL FRAMEWORK

3.1 DENTAL AESTHETICS

Cosmetic dentistry is expressed as a very representative division in modern dentistry, through which the importance given by patients to achieving an aesthetically promising smile is increasingly verified. In addition, the search for a standard of beauty pre-established by

society in which the appearance of the smile must be a real reproduction of natural teeth is notorious (FRADEANI, 2007 apud OLIVEIRA et al., 2019).

However, it is known that dental aesthetics is a crucial reason to achieve a smile considered beautiful and harmonious, and it is essential to determine some parameters, such as the size and shape of the teeth, to establish the formation of a dentofacial pattern. Another important criterion is the golden ratio, which can be applied as a system of aesthetic predictions, whose objective is to work on the harmony between the size and width of the teeth. Therefore, many studies suggest it as an aesthetic criterion that serves to restore and reproduce the previous and superior elements (PONTANEGRA et al., 2022).

Another important factor to be considered in the analysis of the smile is gingival aesthetics, which often requires surgical interventions, such as gingivoplasty and/or gingivectomy, in order to provide an enlargement of the dental clinical crown and correct the proportion displayed in the smile (BARROS et al., 2018). The balance between white aesthetics and red aesthetics is the secret to success in rehabilitation treatments. Thus, it is essential to use interdisciplinary protocols in the various areas of dentistry, especially in periodontics and dentistry, which are connected to treatments for aesthetic purposes (VIEIRA et al., 2018).

Therefore, there are several factors that alter dental aesthetics, including its change in shape, such as trauma; color change due to the state of pulp vitality; use of drugs; diet; pigmentation by filling materials; aging; pulp hemorrhages and surface alterations, such as dental malformation, fluorosis, amelogenesis imperfecta, among others (BARBOSA; NERES; AMARAL, 2021).

3.2 ETIOLOGY OF TOOTH DARKENING

Tooth darkening occurs due to natural aging of the teeth or by factors called intrinsic or extrinsic (TREVISAN et al., 2018). In addition, it has a negative effect on an individual's well-being, especially when it comes to a previous element. In this case, it is common for patients to seek professional help, aiming for a harmonious and satisfactory result (FAGOGENI et al., 2019).

Variation in tooth pigmentation is a common objection of people and has a multifactorial etiology. Of the intrinsic type, it results from odontogenesis, fluorosis, dental weakening as a result of the generation of repairing dentin, trauma, pulp necrosis, among other factors; the extrinsic type is caused by environmental or behavioral factors: smoking, consumption of products with dyes such as coffee, wine, tea, and even the use of medications (BANDÉCA et al., 2010; COSTA et al., 2020; DONATO, 2017).

It is important to note that congenital intrinsic spots are due to dentinogenesis imperfecta, amelogenesis imperfecta, and fluorosis. Acquired lesions, on the other hand, are subdivided into pre-eruption, such as those caused by the use of tetracycline, and posteruptive, such as those resulting from trauma; as well as those of iatrogenic causes, due to the inappropriate use of some root canal filling materials or the performance of metal restorations (CAMARGO et al., 2019).

Another situation is when the endodontic access to the crown is insufficient, generating a grayish stain, caused by necrotic residues of pulp in this region (CAMPAGNOLI; JUNIOR; 2008).

Thus, the change in tooth color is considered an aesthetic difficulty that results mainly from the incomplete removal of pulp tissue during endodontic treatment or even from the prolonged use of some intracanal materials, such as medications used between sessions and also by trauma injuries. Likewise, the color variation occurs due to the rupture of blood vessels, leading to hemorrhage in the pulp chamber, where there is a change in the color of the crown caused by the entry of blood components into the dentin tubules (OLIVEIRA et al., 2019).

The prognosis for rehabilitation of darkened anterior teeth depends on the time in which the trauma occurred, the intervention, the restorative technique chosen, and therefore the extent of the preparation (SILVA et al., 2019).

It is known that pigmented teeth can cause discomfort when smiling and introversion for the patient. However, the treatment for these cases is still complex and involves a precise analysis and understanding of their etiology (BARBOSA; NERES; AMARAL, 2021; DONATO et al., 2017; SILVA NETO et al., 2020).

3.2.1 Dental Trauma

Dental trauma follows a major impact on the teeth, which can lead to injuries to intraoral and extraoral structures, hard and soft tissues, causing from tooth displacement, deformation of the supporting tissues, to fracture of the affected tooth. In this context, dental injury usually happens either occasionally, unexpectedly, or accidentally, and may require emergency care (DANG et al., 2015).

However, those that involve the anterior dental elements influence the function and aesthetics of the individual, affecting their behavior. It becomes an occurrence that goes beyond dentistry and endodontics, being able to include other dental specialties, such as surgery, periodontics, prosthetics and orthodontics (VASCONCELLOS; MARZOLA; GENU 2006).

Therefore, dental trauma is an objection in global public health, caused mainly in children, adolescents, and young adults (LEVIN et al., 2020). Pulp tissue can go through a process called dystrophic calcification, when there is not enough blood and there is the presence of ischemic and necrotic tissues, and can reach the entire length of the tissue, obliterating the entire pulp cavity, leaving the tooth with a dark color of varying nuances (MILESKI et al., 2018).

Therefore, there are diversified options to camouflage teeth with darkened substrates, for example, the use of teeth whitening, composite resins and the use of ceramics. Thus, it is up to the dental surgeon to choose the most appropriate material, following its indications, contraindications, and mastery of the technique (CORDEIRO, 2021).

3.2.2 Endodontic Treatment

According to Mandras et al. (2013), endodontic treatment aims to clean and shape the root canal, favoring the removal of infected or necrotic live pulp 17, reducing the amount of microorganisms and their by-products present.

Regarding endodontic therapy, according to Tour Savadkouhi and Fazlyab (2016), the main causes of the change in tooth color and structure are the filling materials. This is due to its incorporation into the dentin tubules (RABELO et al., 2022).

However, the variation in tooth color generated after endodontic treatment is a challenge to clinical practice and an inconvenience to the patient, due to the undesirable appearance, especially in anterior teeth (BOSENBECKER, 2020).

When the cause of the darkening is due to dental trauma, Marin, Bartold, and Heithersay (1997) report that enamel pigmentation by blood components possibly becomes more expressed with long-term display. Even if enamel does not have tubular morphology, its organic structural characteristics at the dentin-enamel junction may play a role in the staining process.

3.3 TEETH WHITENING

According to Bispo (2018), tooth whitening is a procedure based on scientific evidence that seeks to combat undesirable agents related to color changes of extrinsic or intrinsic cause. Its objective is based on the use of substances that have a high potential for oxygen release through an oxidation reaction of collagen fibers, which occurs due to the oxidation process of organic pigments present in teeth. Whitening agents release oxygen molecules that break down these pigments responsible for tooth stains, thus leading to discoloration of these compounds and resulting in teeth whitening (FIORILLO et al., 2019).

The most commonly used bleaching agents are hydrogen peroxide, carbamide peroxide, and sodium perborate (BANDÉCA et al., 2010; CARDOSO et al., 2011; MARTINS et al., 2009). They are mainly indicated for pigmentation of extrinsic origin, as previously mentioned, arising from pigments present in food and beverages, chromogenic or chromogenic bacteria, tobacco tar and chemical products (BISPO 2018).

The whitening process can be carried out both in the office, by the dental surgeon, applying higher concentrations of hydrogen peroxide or 18 carbamide, and at home, using individual trays with the same bleaching agents at lower concentrations (ALMEIDA et al., 2021; RODRIGUES et al., 2018); or even the combination of the two types of procedures (CAMARGO et al., 2021).

According to Vasconcelos and Nillio (2021), regarding the advantages, it is stated that regardless of the method chosen, tooth whitening is the most careful, economical and regularly used option to solve patients' concerns regarding tooth pigmentation and is very effective in modifying the value of the tooth.

However, it is a technique that requires correct indication and a thorough clinical evaluation, as it has as contraindications the presence of caries, supragingival stones, gingivitis, periodontitis, root exposures, among others. The procedure is also not recommended for children under 18 years of age or for pregnant and breastfeeding women, according to the Council of European Dentists (CED) (VASCONCELOS; NILLIO, 2021).

3.3.1 Internal Whitening

For Maran et al. (2018), endogenous whitening is a choice for teeth that have undergone endodontic treatment, inserting the whitening substances inside the pulp chamber, which can be used in three ways: mediate, immediate, or mixed.

According to De Geus (2018), in the mediate technique, the patient remains with the product inside the pulp chamber for a period of three to seven days, changing it until the desired color is obtained. In the second method, the bleaching agent is applied both inside the pulp chamber and on the buccal surface of the element, obtaining the result soon after the completion of the procedure in a single session. In the mixed process, the two techniques mentioned above are united.

Mediate internal whitening was a widely applied technique due to its minimally invasive characteristic, however, it had some possible side effects, such as external cervical resorption and color recurrence (CARDOSO et al., 2011).

According to Bispo (2008), the effects of pulp tissue decomposition, caused by dental trauma or necrosis, would be the main indication of this technique, as it obtained satisfactory

results in 95% of cases. This happens because the 19 stain comes from the premature destruction of red blood cells, promoting yellowish-brown coloration, originating from the concomitant production of ferrous sulfate in the dentin tubules.

Therefore, another option for the mediate technique would be: sodium perborate with 35% carbamide peroxide (approximate values of 10-12% hydrogen peroxide), in which the release of peroxide radicals is less severe and slower, when compared to the mixture with hydrogen peroxide. In this way, sodium perborate decomposes into sodium metaborate, hydrogen peroxide, and oxygen, thus creating the expected whitening effect (BISPO 2018).

3.3.2 External Whitening

External whitening is more indicated for vital teeth, through office techniques that apply hydrogen peroxide or carbamide peroxide on tooth surfaces, or through the home technique, in which an individual tray is made using the same agents in lower concentrations (BANDÉCA et al., 2010; CARDOSO et al., 2011; MARTINS et al., 2009; RODRIGUES et al., 2018).

Idealized by Ames (1937), according to Marson, Sensi and Arruda (2008) and Azevedo (2009), the bleaching agents used are hydrogen peroxide with its concentrations varying between 6%, 7.5%, 10%, 30%, 38% and 40%, and carbamide peroxide, changing its concentrations between 10%, 16%, 22%, 35% and 37%.

In office whitening, the technique is performed in one or three clinical sessions, with hydrogen peroxide or carbamide solutions, applied to the teeth, most commonly used at a concentration of 35% for the time recommended by the manufacturer. As disadvantages, care must be taken, as hydrogen peroxide is highly oxidizing and harmful to soft tissues when used in large concentrations. Therefore, the gums, tongue and cheeks must be protected by means of retractors and physical barriers (VAZ et al., 2016).

There are 3 forms of presentation on the market, manual mixing with heat blocker, for the use of light sources during the procedure; another of mechanized mixing, which is done by means of 2 syringes attached; and, finally, the double syringe, with its self-mixing tip that only activates the amount sufficient for application (REIS, 2021). 20 For home whitening, a whitening gel based on carbamide peroxide is used with percentages of 10%, 16%, 22% and 35%, or hydrogen peroxide of 6%, 7.5% and 10% (BISPO, 2018).

Its technique consists of the use of individual trays, with which the patient applies the gel himself. Therefore, it is essential that the patient collaborates for an ideal result during treatment (BARBOSA et.al., 2017). The instructions for use of the product should follow the manufacturer's recommendations, which sometimes advises two applications a day lasting between 30 minutes and 2 hours, or one application, depending on the product's interval.

Treatment can last from 2 to 6 weeks. The patient should be instructed on how to place the whitening gel on the trays and how to remove excess (RODRIGUEZ; MARTINEZ, et.al., 2018).

It is worth noting that even considered a safe procedure, whitening may have side effects, such as tooth sensitivity, in addition to little predictability of the final result (BEGUM et al., 2014).

3.4 COMPOSITE RESIN VENEERS

Veneers are defined by the covering of the buccal surface of the dental element by a restorative material, connected to the tooth, which can be made in two ways, by the direct or indirect technique (MAGNE; BELSER, 2003). They are indicated for deficient corrections after orthodontic treatment, such as in cases of congenital disabilities and acquired aesthetic deficiencies, as well as for discolorations, diastemas, abfraction injuries, abrasion and erosion, dental fractures, caries and functional defects (DIETSCHI, 2008).

Despite the many advantages of resins, there are still difficulties when selecting their color. This step is considered essential in restorative success, however, if the anatomical shape is not correct, the result will not seem natural and harmonious either (PONTONS-MELO; FURUSE; MONDELLI, 2011).

Nahsan et al. (2012) ensure the practice of preserving the dental structure, especially in young patients such as children and adolescents, since with each restoration change, which is inevitable throughout the patient's life, there is a healthy tooth loss, inexorable to its practice. Therefore, the first composite resin restoration should be as conservative as possible, avoiding complex costs and treatments in the future.

Aesthetic flaws are one of the main reasons for changing resin restorations. Not only is it necessary to mimic tooth coloring with resin color at the time of restoration, but also that this set maintains its aesthetic properties over time (SCHULZE et al., 2003).

3.5 CERAMIC LAMINATES

Ceramic Laminates are considered an aesthetic method, with appropriate optical properties and correlated with good mechanical resistance, as well as having a high biocompatibility. In this sense, the use of this material is considered one of the preferable treatment alternatives, aiming at modifying the hue and shape of the anterior teeth with aesthetic compromise, such as fractured, darkened or poorly positioned teeth in the arch (KANDIL et al., 2019).

Thus, with the technological development in the area of ceramics and cementing

agents, it is plausible to achieve restorations very similar to natural teeth (TURGUT; BAGIS, 2013).

In this context, the search for aesthetic materials that resemble the natural characteristics of the teeth has made dental ceramic systems improve more and more, and are currently highly demanded in offices, due to their characteristics and clinical performance. Therefore, the daily use of ceramic restorations to reestablish aesthetics in dental clinics is evident (SANTOS; COSTA, 2019).

Currently, ceramics are the crucial alternative restorative material for previously destroyed tooth structure, due to their properties, such as: compressive strength, thermal conductivity, radiopacity, marginal integrity, hue stability and biomimicry (CORDEIRO; MONTEIRO, 2021).

According to Almeida and Silva (2011), lithium disilicate-based ceramics are a great possibility to mask the darkened substrate, since it has good properties in relation to chroma in small thicknesses, excellent mechanical properties.

Santos and Costa (2019) emphasize another important point to be considered, the correct indication of the different types of pure ceramic systems available on the market. To do this, the dentist must understand the main differences between crowns, veneers, lenses, and ceramic laminates, thus reaching the minimum thickness required for these indirect restorations for aesthetic and functional results.

Depending on the variations of substrate in the tooth, a correct selection of the thickness of the ceramic, as well as the color of the cement, is essential for better aesthetic results (VASCONCELOS; NILLIO, 2021).

An important piece of information highlighted by Alothaman and Bamasoud (2018) is that porcelain veneers enable excellent aesthetic results, longevity and patient satisfaction.

Vargas, Bergeron and DiazArnold (2011) explain the classification of ceramic systems, according to the composition of their matrix, into: Glassy Ceramics, Feldspar Ceramics, Glassy Ceramics Infiltrated by Crystalline Particles, Leucite Reinforced Ceramics, Lithium Disilicate Reinforced Ceramics, Crystalline/Polycrystalline Ceramics, Alumina Reinforced Polycrystalline Ceramics and Zirconia Reinforced Polycrystalline Ceramics.

3.5.1 Classification of Ceramics

· Lithium Disilicate Reinforced Ceramics

Classified as a vitreous ceramic with a high crystalline content, its difference is that it can be manufactured with a reduced thickness, up to 0.2 millimeters, without compromising its resistance, and presents excellent aesthetic results (TUNCDEMIR; GULBAHCE;

AYKENT, 2020).

"Lithium disilicate crystals are dispersed in a blocking structure that prevents the propagation of cracks through energy-absorbing processes, such as deflection cracking and branching" (SCHWEIGER et al., 1999).

Its composition is formed by lithium dioxide, alumina, quartz, potassium oxide, phosphoric oxide, in addition to other elements. In addition, it has an appearance similar to natural dentition and high resistance to thermal shock due to its low thermal expansion resulting from its processing (RITTER, 2010).

According to Gundogdu and Aladag (2018), the type of cement and the specific cementation technique applied also play significant roles in the clinical success and longevity of ceramic restorations. Soft-23 cements are recommended for the cementation of all-ceramic restorations, especially for those using silica-based ceramics.

3.6 CEMENTS

Cements are divided into conventional and adhesive. Conventional cements undergo acid/base reaction in their setting process, such as Zinc Phosphate Cement, considered the oldest among cementing agents, which has high intrinsic properties, however, it does not adhere to the tooth structure or the material, requiring retentive preparation (LEE; MCLAUREN, 2012).

In addition, another type of conventional cement is Glass Ionomer Cement (CIV), which binds to calcium by a process called chelation, however, it does not adhere to restorative materials, and retentive preparation is also necessary (ANUSAVICE, 2013).

Resin cements are the most recommended for the adhesive cementation of ceramic tiles. They provide better adhesion, as well as superior mechanical and optical properties (greater selection possibilities and color stability), high hydrolysis resistance, and great tensile strength (CAMARGO et al., 2019; GUILARDI et al., 2020; KIRSTEN et al., 2018).

According to Anusavice (2013), these are classified according to the form of activation, which can be physical, chemical or dual. Physical activation happens through photoactivation, with light as activator and the initiator of the prey, camphorquinone. Chemically activated compounds have tertiary amine (base paste) as an accelerator and benzoyl peroxide (catalyst paste) as a prey initiator. Finally, the dual system has both physical and chemical form of activation.

These cements can also be classified according to the mode of adhesion, which can be conventional, through the hybridization of the dental substrate with conventional, self-etching or self-adhesive dentin adhesives, dispensing with the treatment of the tooth surface

(ANUSAVICE, 2013).

Conventional cements, in addition to favorable aesthetics, have better flexural strength, compression and higher shear strength, greater retention and fracture resistance of restorations, in addition to minimal infiltration and low solubility in aqueous medium (OLIVEIRA, 2013). However, they have the disadvantage of a judicious step, which is the drying of the dental substrate, because while the enamel needs to be completely dry, the dentin needs to be slightly moist for the formation of the hybrid layer to occur, making it a step often neglected by the operator (CHIRCA; BICLESANU; FLORESCU et al., 2021).

Self-adhesive cements have the advantage of simplifying adhesion procedures, saving time and, more importantly, thus reducing the "contamination window" (CAMARGO et al., 2019). They are believed to be moisture tolerant, release fluoride, and have no postoperative sensitivity (MAZIOLI et al., 2017). As disadvantages, adhesion to enamel produces lower bond strength than conventional cements (DE MUNCK et al., 2004; ABOHAMAR et al., 2005; HIKITA et al., 2007; DUARTE JUNIOR et al., 2008). Another example is its high viscosity, limited number of colors, yellowing of the surface due to the presence of tertiary amine and the short shelf life of some commercial brands (SOUZA et al., 2011).

According to Kirsten et al. (2018), most resin cements are dual-cured, composed of both self-curing and light-curing components. In some clinical conditions, the polymerization of light-curing cements becomes deficient due to the distance from the light source, the thickness and opacity of the restoration, which impairs adhesion (AZAD et al., 2018).

It is also worth mentioning the importance of treating the internal surface of the prosthetic piece in strengthening the union between the resin cements and the ceramic restoration, as well as the proper preparation of the enamel and dentin surfaces, which promotes the union between the tooth and the cement, as mentioned above (GUNDOGDU; ALADAG, 2018).

Therefore, the type of cement, the technique employed and the thickness of the restoration play an important role in the clinical success and longevity of ceramic restorations (GUPTA; GUPTA; GILL, 2021).

4 METHODOLOGY

The present study is a case report with a qualitative approach, with descriptive purposes, whose purpose is to show its clinical relevance, facilitate research and new reports on the same theme, based on evidence. To this end, all ethical and legal principles were respected in the conduct of patient treatments, consistent with the precepts of the Declaration of Helsinki of Resolution 466/12 of the National Health Council (CNS).

4.1 RISKS AND BENEFITS

The work presents minimal risks, since the researchers ensured the confidentiality of the information by signing documents such as the Informed Consent Form (ICF) signed by the patient and the Data Use Commitment Agreement (TCUD), avoiding the disclosure of confidential data, invasion of privacy, access to identification data, and risk to the security of the medical record. In case of damages resulting from the case report, full and free assistance will be offered for the necessary time, as well as the right to compensation.

On the other hand, as benefits, the research portrays a treatment option that has the potential to help not only the patient, but similar cases that may eventually arise, providing more scientific basis in the future.

4.2 ETHICAL ASPECTS

The clinical case report was approved by the Research Ethics Committee (CEP) of the INTA University Center – UNINTA, with an opinion number of 6,429,111. After 1 month of the patient's care and the identification of the possibility of reporting the procedure performed, she was informed about the publication of her case and invited to sign the Informed Consent Form (ICF) (Appendix A) and the Image Use Authorization Form (TAUI) (APPENDIX B), allowing the use and disclosure of data from her medical records and radiographic exams. It was evident that, in case of withdrawal, the patient could withdraw from participating in the research and withdraw her consent at any time.

The technical person responsible for the dental clinic was also invited to sign a Term of Trustee (TFD) (APPENDIX C), authorizing the researchers' access to the data contained in the medical records of the patient involved in this research. The letter of consent (APPENDIX D) of the establishment in which the research was carried out was also obtained and then presented to the CEP. The researchers will assume the commitment to maintain ethical conduct when handling and accessing the data in question with the CEP of the Centro Universitário INTA - UNINTA, ensuring the confidentiality of the data collected and the privacy of its contents, as recommended by Resolutions 466/12, of the CNS, through a Term of Commitment for the Use of Data (TCUD) (APPENDIX E).

5 CASE REPORT

The clinical case refers to a 35-year-old female patient who sought dental care in a private practice in the city of SobralCeará, reporting dissatisfaction when smiling, due to the size and color of the anterior dental substrates. After detailed anamnesis, clinical examination and radiographic examinations, tooth darkening of element 11 was identified due to

endodontic treatment and the restoration of composite resin with unsatisfactory color and shape (Figures 1 and 2), in addition to disharmony between the height/width ratio of the other teeth.

Initially, initial impressions were made to obtain a study model and assembly on an articulator for diagnostic wax-up (Figure 3).

Figure 1

Initial clinical appearance

Source: The authors, 2022.

Figure 2

Initial clinical aspect showing tooth darkening in tooth 11

Source: The authors, 2022.

Figure 3

Waxed model

Source: The authors, 2022.

After the planning phase, external tooth whitening was performed in the office technique, in 3 sessions (Figure 4). Then, a silicone guide was made by molding the wax-up (Figure 5) of teeth 13, 12, 11, 21, 22 and 23 with heavy condensation silicon (Zetaplus®); and, subsequently, the mockup (Figure 6) was performed in bisacrolic resin (PROTEMP 3M®) before the dental preparation stage, thus respecting its initial format. Before the approval of the shape of the teeth, the patient requested rounding of the incisal battlements and reduction of 1 mm of the incisal border (Figure 7).

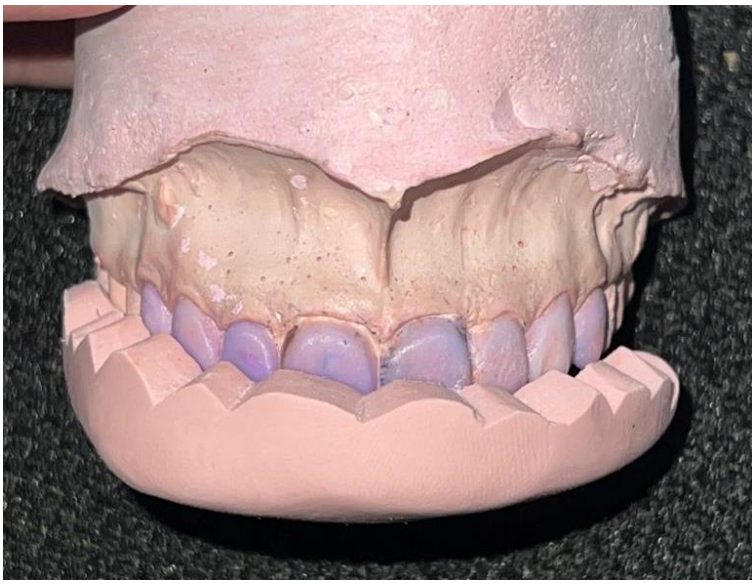
Figure 4

After external tooth whitening. Silicone guide made under diagnostic waxing

Source: The authors, 2022.

Figure 5

Silicone guide made under diagnostic wax-up



Source: The authors, 2022.

Figure 6

1st Mockup in bisacrillic resin

Source: The authors, 2022.

Figure 7

2nd Mockup in bisacrolean resin

Source: The authors, 2022.

Next, the preparation of a ceramic crown was performed on tooth 11, in which a more invasive wear on the cervical third was recommended due to the degree of darkening of the tooth substrate; in the other elements, from 13 to 23, ceramic veneer preparation was performed (Figures 8 and 9). Both preparations were made with a diamond tip with a conical trunk shape with a rounded end – Tip 4138 (KG).®

Figure 8

Preparation for ceramic crown and ceramic veneer

Source: The authors, 2022.

Figure 9

Preparation for ceramic crown and ceramic veneers seen in profile

Source: The authors, 2022.

Then, the molding stage began. First, a retractor wire numbered 000 (Ultrapack-ULTRADENT®) was inserted, followed by the numbering 00 (Ultrapack-ULTRADENT)® (Figure 10). Then, the molding was carried out by the rebasing technique, using a total perforated plastic tray (MORELLI)® and addition silicone of light and heavy consistency (FUTURA DFL®). The preparations were initially captured with heavy silicon and then the internal part of the mold was worn with a spherical diamond drill bit numbered 1018 (KG).® Subsequently, a light consistency silicone was inserted inside the mold and on the surface of the preparations. Next, the tray was repositioned over the upper dental arch. The mold was sent to the prosthetic laboratory for pouring and making of the ceramic pieces.

Figure 10

Image after insertion of the retractor wires

Source: The authors, 2022.

The color selection of the darkened dental substrate was performed through photographs with external lighting sent to the laboratory (Figure 11).

Figure 11

Approximate image with an external light source for color selection in the laboratory

Source: The authors, 2022.

After molding, a third mockup was performed as a temporary character to wait for the veneers to be made, this time with the anatomy previously approved by the patient (Figure 12).

Figure 12

Mockup used as a provisional with anatomy approved by the patient.

Source: The authors, 2022.

The prosthetic specimen was made of ceramic with the addition of lithium disilicate by the injection method (IPS e-max Press, IvoclarVivadent, Schaan, Lietchenstein) (Figures 13, 14, 15, 16 and 17).

Figure 13

Veneers of teeth 12, 13, 22 and 23 adapted to the plaster model.

Source: The authors, 2022.

Figure 14

Personalized coping made over tooth 11

Source: The authors, 2022.

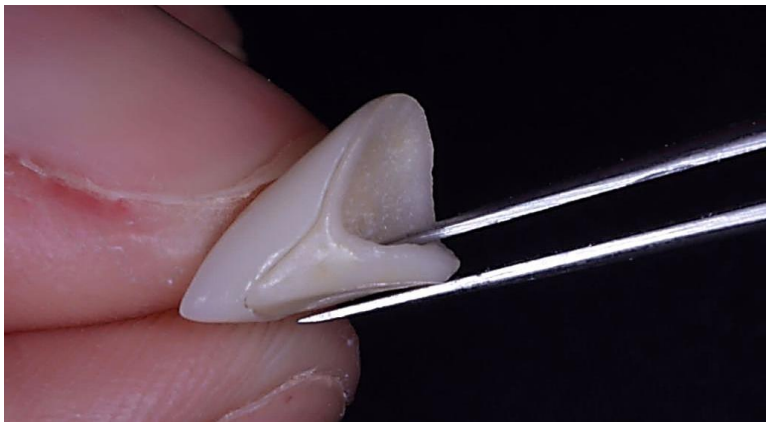
Figure 15

Personalized ceramic coping with overlaid ceramic facet

Source: The authors, 2022.

Figure 16

***A**daptation of the ceramic veneer on the personalized ceramic coping of tooth 11*



Source: The authors, 2022.

Figure 17

Ceramic pieces of elements 13, 12, 11, 21, 22 and 23.

Source: The authors, 2022.

After receiving the ceramic pieces from the laboratory, a dry test was performed to evaluate the adaptation, color, shape, proximal contacts, occlusal contact, and the need for rounding and reducing the incisal edge by 1.0 mm was identified, in addition to deepening the third inclination of the central incisors (Figures 18 and 19).

Figure 18

Dry proof of the ceramic in front view

Source: The authors, 2022.

Figure 19

Dry proof of the ceramic seen in profile

Source: The authors, 2022.

In the second session of the porcelain test, the requested corrections were checked (Figure 20) and, after the patient's approval, the resin cement was chosen through test cements (TRYING-ALLCEM®) (Figures 21 and 22).

Figure 20

Image showing the correction of the 3rd inclination of the central incisors.

Source: The authors, 2022.

Figure 21

Image of the color selection showing tooth 11 with a slightly grayer color

Source: The authors, 2022.

Figure 22

Image showing the correction of the color of tooth 11 after color selection using the test cements

Source: The authors, 2022.

Then, the cementing stage of the pieces began. It was prepared with 10% hydrofluoric acid (Condac porcelain, FGM®) for 20 seconds on its internal surface, cervical edges and on the external surface of the personalized ceramic coping; then, plenty of washing (Figures 23 and 24) and drying with an air jet were performed, followed by the application of silane (Prosil, FGM®) and natural drying for 1 minute (Figure 25).

Absolute isolation of the prepared teeth was performed using Young's archwire (Golgran®), rubber sheet (MADEITEX®) and ties with dental floss (Oral B®) (Figure 26).

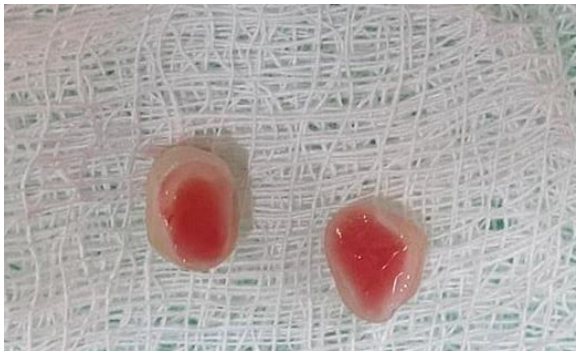
Next, the tooth surface was prepared. Initially, prophylaxis was performed with a Robinson brush (Preven®) and pumice stone (Biodynamics®). Thus, tooth 11 was conditioned with 37% phosphoric acid (Condac - FGM®) for 15 seconds and then a conventional dentin adhesive (Single bond2 – 3M ESPE®) was applied; with the aid of an air jet, the solvent was volatilized for 30 seconds and then photocured for 20 seconds (Radii-cal SDI).® Selective acid was conditioned only on the enamel for 30 seconds on the other teeth; on the dentin, a universal dentin adhesive (Amber Universal APS - FGM®) was applied; the solvent was volatilized with the aid of an air jet and light-cured for 20 seconds. For cementation, a conventional light-curing resin cement (FGM® – Allcem Veneer APS) was used, which was applied inside the pieces that were then positioned on the preparations. Thus, it began with the cementation of the personalized coping and the use of transparent cement; bleach color was used for the cementation of the veneer of tooth 11 over the coping, while for the cementation of the other veneers, the color A1 was used.

The removal of excess cement was done with the aid of a microbrush (KG)® and dental floss (Oral B®). Then, light-curing was performed with a high-power LED photoactivator (Radii Cal-SDI®) for 60 seconds on each tooth face.

After cementing the ceramic pieces, the cementing line was polished with rubbers impregnated with silicon carbide, with medium and fine granulometry (Ultra-Gloss CA – American Burrs ®) (Figures 27 and 28).

Figure 23

Conditioning of the parts with 10% hydrofluoric acid for 20 seconds



Source: The authors, 2022.

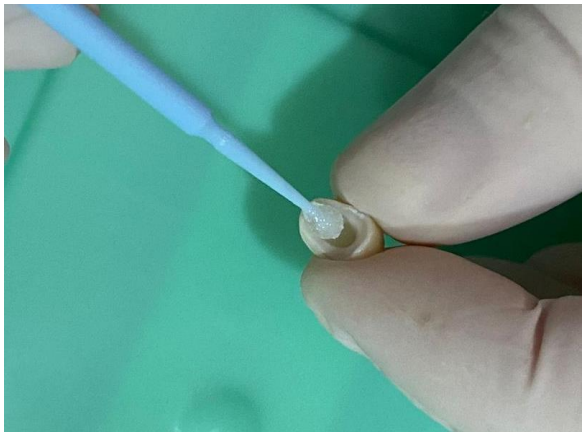
Figure 24

Plenty of washing

Source: The authors, 2022.

Figure 25

Application of silane (Prosil, FGM)



Source: The authors, 2022.

Figure 26

Absolute isolation

Source: The authors, 2022.

Figure 27

Final aspect with frontal view

Source: The authors, 2022.

Figure 28

Final appearance with profile view

Source: The authors, 2022.

After 5 months, maintenance of the ceramic veneers was performed, in which a new polishing of the cementation line was performed with fine polishing rubbers (America burrs®) (Figures 29 and 30).

Figure 29

Maintenance of veneers

Source: The authors, 2022.

Figure 30

Maintenance of veneers

Source: The authors, 2022.

6 DISCUSSION

According to Magner and Belser (2003), indirect veneers are indicated when dental problems arise in terms of shape, position, symmetry, texture and color, as can be seen in the case reported, in which the patient's main complaint was dissatisfaction with the color and shape of the anterior maxillary dental elements.

However, ceramic laminate veneers have been shown to be a successful treatment option for aesthetic rehabilitation in clinical practice in recent years. Ceramics have become the material of first choice as their excellent properties have been highlighted, such as biocompatibility, color stability, longevity, tooth-like appearances, different degrees of translucency and predictability of results (BENETTI et al., 2003).

Edelhoff et al. (2018), in addition to the aesthetic advantages, also reported the importance of ceramic restorations in terms of their biomechanical characteristics, such as high mechanical strength, durability, reestablishment of the biomechanics of the dentition and adequate function.

Therefore, as can be observed in the case in question, the heterogeneity of the substrate colors due to the presence of tooth darkening and pigmented restorations motivated the choice of lithium disilicate for the manufacture of veneers, due to its optical, biomechanical and adhesive properties, which reinforce the factors previously mentioned in the literature.

For Catão et al. (2007), the main danger associated with the internal whitening of a pulped tooth is the possible occurrence, within seven years after the procedure, of external dentin resorption. This resorption manifests itself in the neck of the tooth, in the area adjacent to the gingiva and is located near the point where the guttapercha was sealed, extending towards the apical end to the crest of the alveolar bone.

The origin of this phenomenon is not completely clear. However, there is speculation that hydrogen peroxide, when activated by heat, may diffuse through the dentin tubules until it reaches the region of the cervical periodontal ligament, potentially causing alterations in these structures and resulting in cell necrosis, thus triggering a process of inflammatory resorption (CATÃO et al., 2007).

Endorsing this information, Wendler et al. (2017) reported that lithium disilicate (IPS E.max - IvoclarVivadent), in its ability to reproduce the natural enamel of teeth, has excellent mechanical and aesthetic properties, as it has different opacity scales, ranging from translucent to opaque, thus having an impressive potential to mask different types of darkened substrates, resulting in color stability.

In addition, it is important to highlight the great advantage of using this ceramic system, which allows the manufacture of different restorations, as well as veneer and total crown. This is because the use of the same ceramic material for both restorations avoids aesthetic compromise between teeth and adjacent restorations, considering that there will be no influence of different optical properties resulting from different ceramic systems (PERRONI et al., 2015).

It is known that, in addition to the selection of the material of choice, a series of factors such as the thickness of this material, cement to be used, and the underlying structure of the tooth are essential for the success of the aesthetic rehabilitation treatment, as it has its particularities in the influence of the final color of the restorations (GEL, 2018).

In the present case, two distinct types of dental preparations can be observed, which were motivated by the type of rehabilitation to be performed and the degree of pigmentation of the dental substrate. Dental preparations for veneers are commonly limited to enamel, making ceramic pieces very thin and translucent. Therefore, laminates allow light to be transmitted through them and light scattering and reflection from the substrate, making it challenging to mask the underlying structures of the prepared tooth (EDELHOFF et al., 2018).

According to Sari et al., (2018), the thickness of the piece directly interferes with the final aesthetic result, since a thicker laminate will be less translucent and more opaque, thus reducing the effects of diffuse reflection of the underlying tooth, improving the propensity for masking.

In the case reported, tooth darkening of the acquired intrinsic type caused by endodontic filling materials in element 11 was observed, and of the extrinsic type caused by unsatisfactory restorative material. The literature reports the importance of the etiology of tooth darkening, as it is known that, in endodontically treated teeth, progressive pigmentation can occur that is difficult to remove caused by the presence of some endodontic filling cements positioned in the pulp chamber (ALSUBAIT; AL-HAIDAR; AL-SHARYAN, 2017).

In addition to the change in the color of the substrate, the intensity of darkening is also an important factor in the planning for this type of rehabilitation, influencing the amount of wear and the optical characteristics of the prosthetic specimen (ALSUBAIT; AL-HAIDAR; AL-SHARYAN, 2017).

Another important step for the success of rehabilitation is cementation, a fundamental factor for the longevity of the treatment. For the case in question, resinous cements of the conventional type were used, in order to obtain color stability and a lasting bond of the ceramic pieces with the dental tissue.

Reaffirming this information, Basso et al., (2017), report that the use of lithium disilicate crystals allowed the emergence of extremely thin ceramic veneers (3mm), associated with minimally invasive preparations. However, for this type of restoration, the use of appropriate resin cements is essential for the maintenance of aesthetics and color stability, since the small thickness of these restorations does not allow to mask the color changes of chemically activated cements, since these, together with dual resin cements, have tertiary amine as a chemical activator in their composition, which can compromise and cause changes in color over time, thus causing disharmony between restorations.

In line with what was reported, Perroni et al., (2016) state that these cements have different shades, and when the color of the ceramic is not completely satisfactory, it is possible to manipulate the tone of the cement so that a good color combination is reached between the laminates to be cemented and the adjacent teeth, which has become a high point in the choice of this type of cement for the case in question.

In this case, the lithium disilicate ceramic crown, as well as the veneers, aimed to mimic the substrate of element 11 compared to the other previous elements (13, 12, 21, 22 and 23), in order to harmonize the same nuance for everyone. To this end, the use of conventional resin cement was favored due to the wear obtained by the preparation of the ceramic crown on tooth 11, which allowed the application of an opaque layer at the base of the restoration. Conventional resin cements also allow for adhesive bond quality. Confirming the present case report, a good mimicry was observed, even in the case of substrates of different thicknesses and colors in more than one dental element.

7 CONCLUSION

During the planning of aesthetic rehabilitation of darkened teeth, the dental surgeon must understand the etiology of tooth staining, as well as the best masking alternative. In addition, it is essential to know the materials for choosing indirect restorations, their correct indications and limitations so that the objectives outlined in the treatment plan are achieved.

Therefore, it was possible to conclude that lithium disilicate ceramic system restorations are excellent restorative materials due to their variability and ability to mimic dental substrates of different colors, in addition to their color stability and long-term strength.

Finally, together with the choice of the restorative material, it was possible to see that the final color of the restorations is influenced by the type and thickness of the ceramic material chosen, the amount of wear on the substrate and the shade of the selected resin cement, emphasizing that all these factors must be planned in advance to obtain the desired harmony between color and shape at the end of the treatment.

REFERENCES

Cavigli, L., et al. (2022). The acute effects of an ultramarathon on atrial function and supraventricular arrhythmias in master athletes. Journal of Clinical Medicine, 11(3), 528.

Contreras-Briceño, F., et al. (2021). Circulating vascular cell adhesion molecule-1 (sVCAM-1) is associated with left atrial remodeling in long-distance runners. Frontiers in Cardiovascular Medicine, 8, 737285.

D'Andrea, A., et al. (2010). Left atrial volume index in highly trained athletes. American Heart Journal, 159(6), 1155–1161.

D'Andrea, A., et al. (2016). Exercise-induced atrial remodeling: The forgotten chamber. Cardiology Clinics, 34(4), 557–565.

D'Ascenzi, F., et al. (2013). Characterization of right atrial function and dimension in top-level athletes: A speckle tracking study. The International Journal of Cardiovascular Imaging, 29(1), 87–94.

D'Ascenzi, F., et al. (2014). Morphological and functional adaptation of left and right atria induced by training in highly trained female athletes. Circulation: Cardiovascular Imaging, 7(2), 222–229.

D'Ascenzi, F., et al. (2015). Increased left atrial size is associated with reduced atrial stiffness and preserved reservoir function in athlete's heart. The International Journal of Cardiovascular Imaging, 31(4), 699–705.

D'Ascenzi, F., et al. (2015). Training-induced dynamic changes in left atrial reservoir, conduit, and active volumes in professional soccer players. European Journal of Applied Physiology, 115(8), 1715–1723.

D'Ascenzi, F., et al. (2016). Atrial chamber remodelling in healthy pre-adolescent athletes engaged in endurance sports: A study with a longitudinal design. International Journal of Cardiology, 223, 325–330.

D'Ascenzi, F., et al. (2016). P-wave morphology is unaffected by training-induced biatrial dilatation: A prospective, longitudinal study in healthy athletes. The International Journal of Cardiovascular Imaging, 32, 407–415.

Di Gioia, G., et al. (2025). Right and left atrial strain by speckle-tracking echocardiography: Sex differences and correlation with cardiorespiratory fitness in Olympic athletes. Journal of the American Society of Echocardiography, 39(2).

Diaz Babio, G., et al. (2021). Atrial size and sports: A great training for a greater left atrium—how much is too much? The International Journal of Cardiovascular Imaging, 37, 981–988.

Elliott, A. D., et al. (2016). Atrial fibrillation in endurance athletes: From mechanism to management. Cardiology Clinics, 34(4), 567–578.

Lakatos, B. K., et al. (2020). Relationship between cardiac remodeling and exercise capacity in elite athletes: Incremental value of left atrial morphology and function assessed by

three-dimensional echocardiography. Journal of the American Society of Echocardiography, 33(1), 101–109.

Pagourelias, E. D., et al. (2013). Right atrial and ventricular adaptations to training in male Caucasian athletes: An echocardiographic study. Journal of the American Society of Echocardiography, 26(11), 1344–1352.

Pelliccia, A., et al. (2005). Prevalence and clinical significance of left atrial remodeling in competitive athletes. Journal of the American College of Cardiology, 46(4), 690–696.

Sanz-de la Garza, M., et al. (2016). Acute, exercise dose-dependent impairment in atrial performance during an endurance race. JACC: Cardiovascular Imaging, 9(12), 1380–1388.

Simard, F., et al. (2022). Sex as a main determinant of bi-atrial acute and chronic adaptation to exercise. European Journal of Applied Physiology, 122, 2585–2596.

Spencer, L. W., et al. (2024). Atrial cardiomyopathy in endurance athletes. NPJ Cardiovascular Health, 1, 1–9.

Szałek-Goralewska, A., et al. (2025). Assessment of atrial strain variations in amateur runners. International Journal of Cardiology, 421, 132880.

Wilhelm, M., et al. (2012). Long-term cardiac remodeling and arrhythmias in nonelite marathon runners. The American Journal of Cardiology, 110(1), 129–135.

Zimmermann, P., et al. (2022). Athlete's heart in elite biathlon, Nordic cross-country and ski-mountaineering athletes. Journal of Cardiovascular Development and Disease, 9(8), 8.

APPENDIX

INFORMED CONSENT FORM (ICF)

Research entitled: Aesthetic rehabilitationusing the technique of double cementto mask dental substratesof different colors – case report, proposed by the researcher in chargeProf. Me. Conceição Mikaelly de Vasconcelos Linhares and assistant researcher Adria Stephanie Xavier Barroso.

Dear participant,

This document you are reading is called the Informed Consent Form (ICF). It containsan explanationof the study that you are being invited to participate in. Before deciding whether to authorize (of your ownfree will) the useof your clinical data, you should read the term and understand the research proposal. At the end, if you decide to participate, you will be asked to sign accepting the conditionspresented. Before signing, askquestions about everything you have notunderstood well, through the contacts provided. The study teamwill answer your questions at any time (before, during, and afterthe study). This consent form is printed in two copies, one copy of whichwill be filed by the responsible researcher, and the other will be provided to the participant. For any other information, you can contact the researcher by e-mail mikaelly.linhares@flucianofeijao.com.br or by phone (85) 99617-0990 and motivate my decision, if you wish.

Nature and objectives of the study

The objective of the study will be to report its clinical casewhich consists ofthe use ofthe technique of double cementto mask dental substratesof different colors, in a scientific environment, due to the particularities of theirclinical condition, diagnostic methodologyand the proposed treatment.

Study procedures

Its participationconsists of authorizing the useof itsdental record that is in the archives of theDENTAL CLINIC clinic, located at Rua Eurí pedesFerreira Gomes, 380, Pedrinhas. Zip Code: 62040-750, for the collection of your clinical data, laboratory, photographic imagesfor the purpose of reporting the clinical case.

Risks and benefits

The risks are minimal, since the researchersensurethe confidentiality of the information by means of documents, which refer to the possibility of disclosureof information, regarding access to identification data, invasionof privacy, disclosureof confidential data and risk to safetyof the ready. In case of damages resulting from the case report, full and free assistance will be offeredfor the necessary time, as well as the right to compensation.

Benefits: As benefits, this study will contribute to improvingthe diagnosisand therapeutic managementof cases similar to this one, enabling further studies in the future.

Participation, refusal and right to withdraw from the study

Their authorization is voluntary. Refusal to authorize will notresult in any penalty or modificationin the form of care provided bydentists, assistants and researchers.

As provided by the Brazilian standards for research with the participationof human beings, youwill notreceive any type of financial compensationfor your participationin this study.

Confidentiality

Your data will behandled only by the researchers and will notbe allowed access to other people.

The results of this work maybe presented at conferences, conferences or scientific journals, however, itwill only show the results obtained as a whole, without revealing its name, or any informationthat is related to its privacy.

Considering that I have been informed of the objectives and relevance ofthe proposed study, howmy participation will be, the procedures and risks arising from this study, I declare my consent to participate in the research, as well asI agree that the data obtained in the research be used for scientific purposes(disseminationat events andpublications).

In case of doubtsregarding the ethical aspects of this study, you may consult the Research Ethics Committee – CEPof the INTA-UNINTA University Center, which is located at Rua Coronel AntônioRodrigues Magalhães, 700, 2nd floor (in front of the Selection Processes Board)) – Administrative pr – Bairro Dom

Expedito – Sobral – Ceará – C.E.P. 62.011-230. Phone (88) 3112-3500, (88) 9.99420072 ext. 3552 – e-mail: cep@uninta.edu.br/sec.cep@uninta.edu.br.

The researcher in chargedeclares that the research followsCNS Resolution 466/12.

Tatiana Soares Sousa Pedra

Participant's Signature

Conceição Mikaelly de Vasconcelos Barbosa

Signature of the Principal Investigator

TERM OF AUTHORIZATION FOR THE USE OF IMAGE (TAUI) IN ACCORDANCE WITH THE GENERAL LAW FOR THE PROTECTION OF PERSONAL DATA (LAW NO. 13,709/2018)

By this TERM OF AUTHORIZATIONFOR THE USE OF IMAGE, I, Taiana Soares Souza Rocha, Brazilian nationality, marital status Married, bearer of RG n.º 2003023035477, registered with the CPF under no.º 035.783.273.60, residing at Rua Miriam Mont Alverne n.º 919, city Sobral – state of Ceará; in this act, and for all purposes admitted in law, I expressly authorize theDENTAL CLINIC Clinic, located at Rua Eurípedes Ferreira Gomes, 380, Pedrinhas. Zip Code: 62040-750. Telephone: (88) 99381-4948, hereinafter referred to as AUTHORIZED, the capture, use, custody and exhibition/executionof the image ina definitive and free car, resulting from their participationinthe photography session, carried out for the planning and executionof dental treatmentof cer facetsproduced by theDental Clinicof the University CenterINTA – UNINTA, for exclusively educational purposes, and may be used at any time by the AUTHORIZED PARTIES, in accordance with the General Law for the Protectionof Personal Data (Law No. 13,709/2018).

This authorizationcovers all forms of use and modalities of usepermitted, known or hereafter known, including, but notlimited to, the followingsituations:

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As this is the expressionof my will, I declare that I authorize the use described above without there being anything to be claimedin terms of rights related to the image or any other, and I sign this authorizationin 02 copies of the same content and form.

Sobral, May 08, 2023.

Tatiana Soares Sousa Pedra AUTHORIZING OFFICER

I, Josis Aristeu de Vasconcelos Neto, head of the private clinicDENTALCLINIC, faithfuldeposit of thedentalrecordsof the patient in question, I authorize the researcher Adria Stephanie Xavier Barroso to collect data from the recordsfor the purposes of his course completion workstudy entitled " Aesthetic rehabilitationusing the technique of double cementationto mask dental substratesof different colors – case report".

Sobral, May 08, 2023.

Josis Aristeu de Vasconcelos Neto

I, Josis Aristeu de Vasconcelos Neto legally responsible for the OdontolClinic Clinic in order to enablethe execution of the research project entitled: Aesthetic rehabilitationusing thetechnique of double cementto mask dental substratesof different colors – case report, under the responsibility of the researcher ConceiçãoMikaelly de Vasconcelos Linhares, Adria Stephanie Xavier Barroso, I declare that theOdontolClinicDENTALCLINIC allows the use of its facilities, as well as the useof the data contained in the medical record of thepatient involved in this research.

Agreed and aware.

Sobral, May 08, 2023.

Dr. Josis Aristeu de Vasconcelos Neto

CRO-CE

Rua Eurí pedesFerreira Gomes, 380, Pedrinhas

Sobral/CE

(88) 993814948

jaristeu@gmail.com

The responsible researcherConceição Mikaelly de Vasconcelos Linhares and assistant researcher Adria Stephanie Xavier Barroso, of the research project entitled "Aesthetic rehabilitationusing the technique of double cementto mask dental substratesof different colors – case report", we declare, for due purposes, to know and comply with the Brazilian Ethical Resolutions, in particular ResolutionNo. 466/12 of the National Health Council.

We are committed to maintaining ethical conduct when handling and accessing the data contained in the medical record, in the files of radiographic images, tomographyand photographsthat arethe responsibility of custody and protectionof theDental Clinic DENTALCLINIC, located at Rua Eurípedes Ferreira Gomes, 380,Pedrinhas, Sobral-CE, Cep: 62040-750, which will be used only afterreceiving the approvalof the ethicsand research committee (CEP) of the Centro UniversitárioUNINTA, within the established by Resolutionnumbers196/96 and 466/12, of the National Council of Healthde/MS, for human experiments.

We are committed to ensuring the confidentiality and secrecy of the data contained in the record, in the files of radiographic, tomographicand photographic images, as well as the privacy of its contents, maintaining the moral integrity and privacy of the individualwho will have their informationaccessed. We will notpass on the data and images collected in its entirety, or part of it, to people notinvolved in the research team.

We are alsocommitted to the safekeeping, care and useof information only for the fulfillment of the objectives set forth in this research referred to here. Any other research in

which we need to collect information will be submitted for considerationby the ethicsand research committee (CEP) of the Centro Universitário The data obtained from the documentary research will bekept confidential, secure, confidential and private, for five years, and then destroyed.

By publishing the results of the research, we will maintain the anonymity of the person whose data was searched, as well as the anonymity of the OdontolClinic Clinic.

Sobral, May 08, 2023.

Conception Mikaelly de Vasconcelos Linhares

Principal Investigator

Adria Stephanie Xavier Barroso

Research Assistant