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UNIVERSIDADE ESTADUAL PAULISTA
"JÚLIO DE MESQUITA FILHO"
Instituto de Ciência e Tecnologia
Campus de São José dos Campos

Case Report

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Prosthodontic reintervention in a young patient with esthetic disharmony and periodontal injury: a clinical report with a 36-month follow-up

Reintervenção protética em paciente jovem com desarmonia estética e injuria periodontal: um relato clínico com acompanhamento de 36 meses

Jefferson Pires da SILVA JÚNIOR[1], Cláudio MOREIRA JÚNIOR[2], Renata Cristófori VILAS BÔAS[2], Victória Garcia CARVALHO[2], Amanda ROSSATO[2], Pedro Henrique Condé Oliveira PRADO[3], Sérgio Eduardo de Paiva GONÇALVES[2]

1 – Universidade Federal do Amazonas. Manaus, AM, Brazil.
2 – Instituto de Ciência e Tecnologia, Universidade Estadual Paulista "Júlio de Mesquita Filho". São José dos Campos, SP, Brazil.
3 – Faculdade Anhanguera. São José dos Campos, SP, Brazil.

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ABSTRACT

Objective: the present study aims to report a clinical case of prosthetic reintervention, discussing the clinical factors involved in decision-making and illustrating a rehabilitation protocol with a long-term follow-up (36 months). **Case report:** A 25-year-old female patient presented to the dental clinic of a higher education institution with complaints of esthetic dissatisfaction when smiling and bleeding around the teeth when cleaning. On intraoral examination, a thick and irregular periodontium was observed, in addition to the presence of deficient veneers in shape, size and adaptation on teeth #11 and #21. Probing revealed prosthetic maladaptation at the gingival margin and abundant bleeding. The planning involved the removal of the veneers, recovery of periodontal health with supra- and subgingival scaling, study of the shape of the new facets and cementation, where rubber dam was performed from the immediate sealing of the dentin to the cementation of the ceramic crowns. **Conclusion:** Despite periodontal limitations, the restorative procedures were able to act on injuries and promote health to the tissues, where after 36 months, a correct integration between the periodontal tissue and the restorative material is perceived, presenting favorable biomimicry. Attention to the signs of restorative failures is paramount for therapeutic decisions involving dental and periodontal health.

Keywords

Cementation; Ceramics; Esthetics, Dental; Periodontium; Rubber Dams.

RESUMO

Objetivo: O presente estudo tem como objetivo relatar um caso clínico de reintervenção protética, discutindo os fatores clínicos envolvidos na tomada de decisão e ilustrando um protocolo de reabilitação com acompanhamento de longo prazo (36 meses). **Caso clínico:** Paciente do sexo feminino, de 25 anos, compareceu à clínica odontológica de uma instituição de ensino superior com queixas de insatisfação estética ao sorrir e sangramento ao redor dos dentes durante a higienização. Ao exame intraoral, observou-se um periodonto espesso e irregular, além da presença de facetas deficientes em forma, tamanho e adaptação nos dentes 11 e 21. A sondagem revelou desadaptação protética na margem gengival e sangramento abundante. O planejamento envolveu a remoção das facetas, recuperação da saúde periodontal com raspagem supra e subgengival, estudo da forma das novas facetas e cimentação, onde foi realizado sobre isolamento absoluto desde o ato de selamento imediato da dentina até a cimentação das coroas cerâmicas. **Conclusão:** Apesar das limitações periodontais, os procedimentos restauradores foram capazes de atuar sobre as lesões e promover a saúde dos tecidos, onde, após 36 meses, percebe-se uma correta integração entre o tecido periodontal e o material restaurador, apresentando favoravel biomimética. A atenção aos sinais de falhas restauradoras é primordial para decisões terapêuticas que envolvam a saúde dental e periodontal.

Palavras-chave

Cimentação; Cerâmicas; Estética dental; Periodonto; Dique de Borracha.

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INTRODUCTION

A harmonious smile depends on the combination of healthy teeth and gums [1,2]. Alterations such as crooked teeth, spaces between teeth, cavities, or gum disease can compromise aesthetics and oral health, impacting self-esteem and quality of life [2]. Aesthetic procedures range from non-invasive protocols, characterized by the absence of tooth wear, to more complex interventions. In this context, therapies encompassing tooth preparation for crown replacement, immediate dentin sealing (IDS), and composite resin addition represent a sufficiently invasive maneuver; although restorative, these procedures require mechanical tissue removal and professional management of the exposed dentin to ensure the maintenance of pulp vitality [3-5]. The choice of treatment depends on the degree of alteration necessary in the color and shape of the tooth, as well as the patient's expectations [4].

The evolution of dental materials, such as resins and ceramics, has improved the aesthetics and durability of treatments [5,6]. However, the occurrence of failures, such as secondary caries and fractures, remains a challenge in restorative dentistry [7-10]. The quality of the final result depends on the professional's technique, as errors during the procedure can lead to complications [7]. The planning and execution of fixed prostheses must consider periodontal health [8,9].

Clinical outcomes in fixed prosthodontics are heavily influenced by operator-dependent factors and technical errors committed during clinical execution. Mistakes during these procedures as well as structural deficiencies in the prosthesis regarding its shape, emergence profile, and anatomical contour can induce inflammation and subsequent loss of periodontal tissue, thereby compromising both smile aesthetics and function. Achieving a harmonious and healthy clinical outcome depends on a balanced relationship between the prosthetic margin and the surrounding periodontium [1,2]. Consequently, previous research has sought to determine the specific characteristics and technical variables that influence these prosthetic rehabilitation alternatives.

Therefore, this study aims to report a clinical case of prosthetic reintervention due to patient dissatisfaction regarding restoration shape, size, and marginal adaptation. Additionally, it discusses the specific clinical factors influencing the decision-making process and illustrates a comprehensive rehabilitation protocol with a 36-month follow-up.

CLINICAL REPORT

Diagnosis and treatment plan

A 25-year-old female, melanoderma, normotensive patient presented to the dental clinic of a higher education institution (ICT/UNESP) reporting dissatisfaction when smiling as the main complaint and noticing bleeding around teeth #11 and #21 when cleaning. During the anamnesis, it was reported that approximately 36 months ago, the patient underwent a prosthetic treatment with ceramic veneers on the upper central incisors #11 and #21 for esthetic-functional reasons due to accidental fracture. However, the patient still expressed dissatisfaction with the outcome, but did not wish to be exposed to surgical periodontal treatments.

During the extraoral clinical examination, a common facial pattern with a triangular profile and homogeneous distribution of the facial thirds was observed. On the other hand, the intraoral clinical examination revealed: the presence of appropriate lateral and protrusive guidance, both lateral and protrusive; satisfactory composite resin restorations in the posterior teeth and unsatisfactory restorations in the lingual surfaces of the anterior teeth; as well as the presence of unsatisfactory ceramic pieces in teeth #11 and #21 in terms of shape, size and adaptation (Figure 1A). This condition becomes evident as the pieces are observed from different views (Figure 1B). In the lateral view, there is a discontinuity along the occlusal plane of the arch and disharmony for the distribution of the three thirds: cervical, middle and incisal, more evident in the occlusal view (Figures 1C and 1D). The periodontal assessment revealed a flat thick gingival phenotype, supragingival calculus, and a probing depth (PD) of 3.0 mm with bleeding on probing (BoP) at teeth #11 and #21. Despite the inadequate emergence profile and the excessive cervical ceramic contour (Figure 1E), no violation of the supracrestal tissue attachment was observed during transgingival probing. Furthermore, radiographic examination revealed no root surface irregularities or signs of periapical pathology. Pulp vitality was

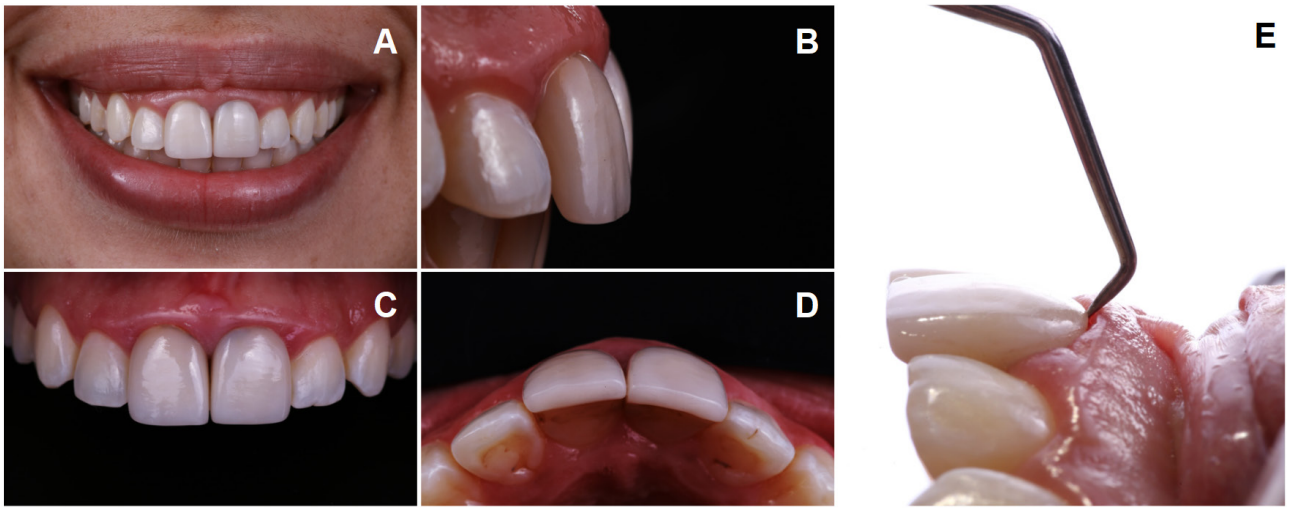


Figure 1 - (A) Initial smile appearance; (B) Lateral view verification of the interposition of the arches with the dental thirds; (C) Emphasizing the smile in frontal view; (D) Incisive view showing the differentiation of the distributions of the dental thirds; (E) Simulation of the gap by means of the survey.

confirmed by a thermal test with refrigerant gas (Endo Ice Spray, Maquira, Maringá, PR, Brazil).

Based on these clinical characteristics, combined with the main complaint, the treatment plan was outlined involving only the replacement of the ceramic pieces. After the patient agreed to the treatment plan, the informed consent form was signed, and the treatment procedure was initiated.

Protocol for removal of existing veneers

Initially, for prophylactic purposes, cleaning was performed with pumice stone (SS White, Juiz de Fora, MG, Brazil) associated with distilled water rubbed on the tooth surface with a Robinson brush coupled to the contra angle in low speed. Next, the color was measured, highlighting the color A2 on the Vita scale. Immediately after, the mold was made with addition silicone (Express XT, 3M, Minnesota, USA) mixing the ratio of 1:1 density with a catalyst. Subsequently, anesthetics were performed using 4% articaine associated with epinephrine at a concentration of 1:100,000 in an infiltrative manner on teeth #11 and #21 for the blockage of the anterior superior alveolar nerve. With the total analgesia of the target region, the #212 R and L clamps were sequentially selected, which were activated with the aid of #139 orthodontic pliers after temper breakage caused by exposure to the torch (Figure 2A).

After selecting the clasps, cervical-incisal grooves were made in the center of teeth #11 and #21 using half the thickness of a #2135 diamond tip at high speed as an initial guide (Figure 2B). These grooves served as support for the insertion of a straight lever, where from the moment of rotation, the pieces were removed without major damage to the dental structure. In lateral view, the thickness of the removed piece can be seen containing approximately 2 mm, in addition to the presence of demineralized tissue, poorly polymerized resin cement, lack of cementing agent, overcontouring and maladaptation of the restorative material in the cervical region (Figures 2C and 2D). In addition, it was decided to remove the proximal restorations involving the mesial of #11 and #21.

Replacement of direct restorations in composite resin

After the removal of the pieces and the excess cement with multi-layered burs at low speed, absolute isolation of the operating field from teeth #13 to #23 was performed using a thick blue rubber dam (RD) (Nictone Rubber dam, MDC Dental, Zapopan, Jalisco, Mexico). To stabilize the posterior of the sheet, accessory clamps were used instead of master clamps (Figure 3A). After isolation, the teeth were subjected to sandblasting with aluminum oxide 29-μm aluminum oxide for 10 s in each region, and the area was washed abundantly with air and water jet (Figure 3B). The proximal extension of the preparations must be carefully planned to ensure that the restoration margins remain hidden from a lateral view. Next, the adjacent teeth were

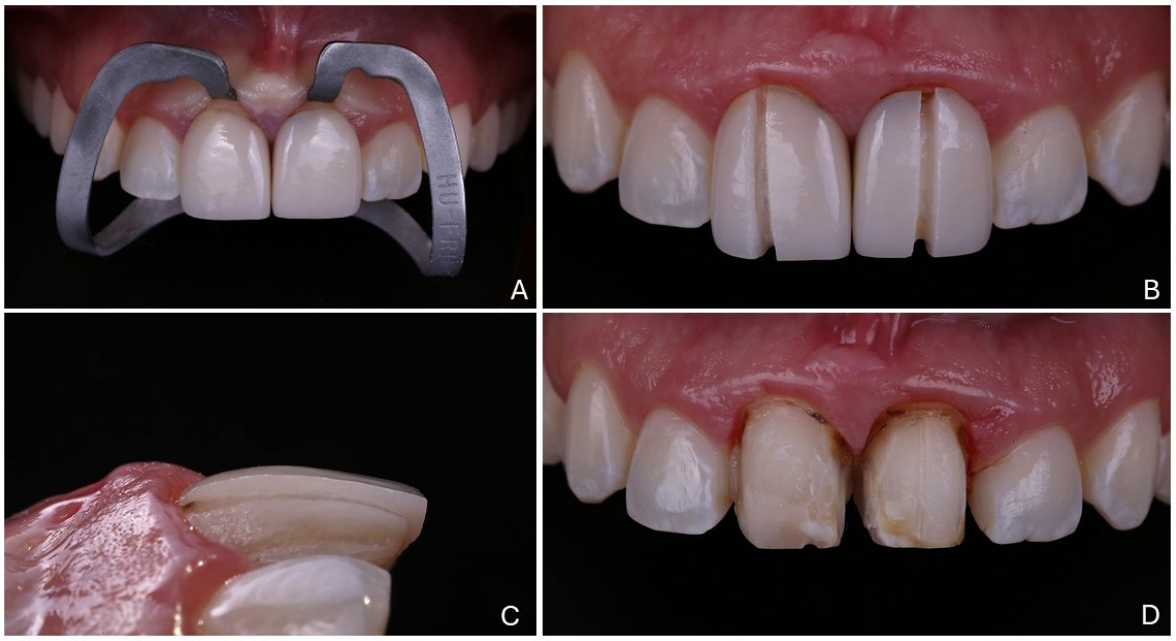


Figure 2 - (A) Clamp test; (B) Section of ceramic veneers; (C) Ideal view verification of ceramic fragment thickness; (D) Substrates after removal of veneers.

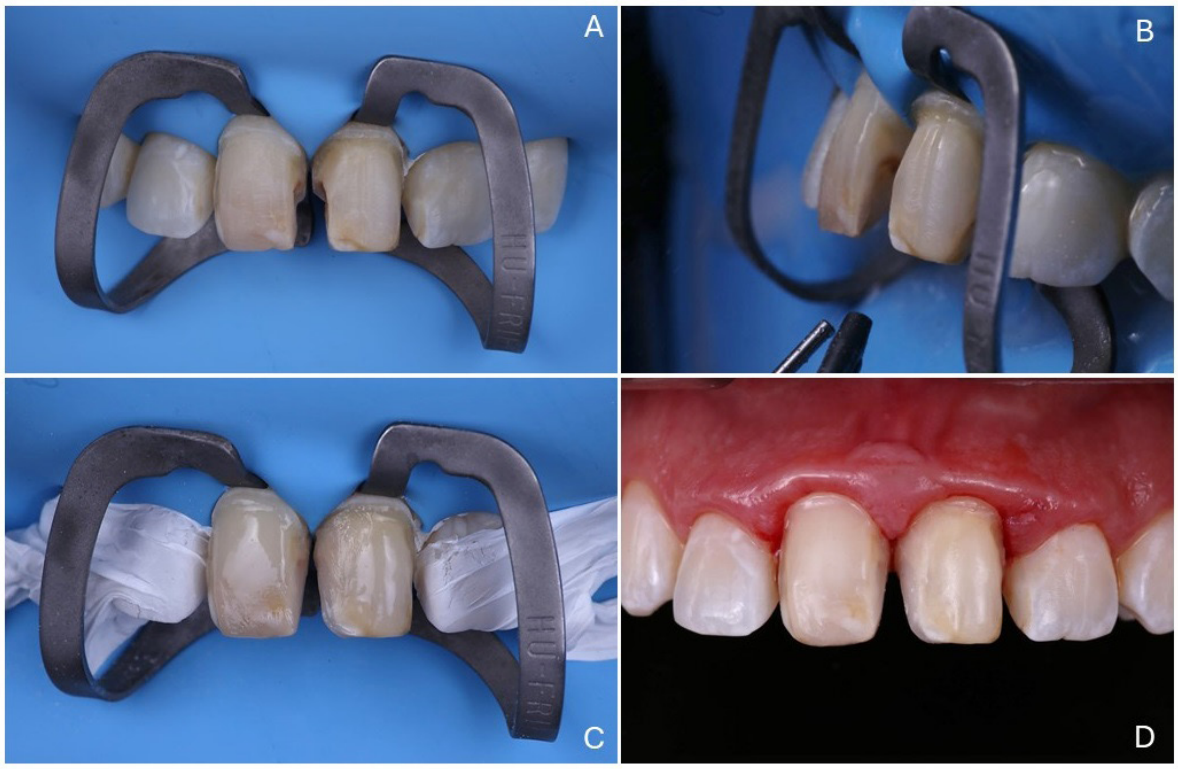


Figure 3 - (A) Absolute isolation of the operating field; (B) Alumina oxide blasting on dentin substrates; (C) Immediate dentin sealing of substrates with composite resin filling; (D) Appearance of substrates after remodeling of preparations.

protected with polytetrafluoroethylene teflon tape and #11 and #21 were conditioned with 35% phosphoric acid (Ultra-etch, Ultradent, Indaiatuba, SP, Brazil) in the dentin for 15 seconds (s) and in the enamel for 30s, followed by washing with water for removal.

Following acid conditioning, which demineralized the tooth and removed the smear layer, an adhesive system (Optibond FL, Kerr, Biberach, Germany) was applied using a micro-applicator (Aplik, Angelus, Londrina, PR, Brazil). The primer was applied first, followed

by solvent evaporation with a light air jet. Subsequently, a thin layer of adhesive was applied and light-cured (Elipar Deep Cure, 3M, Minnesota, USA) at an intensity of 1,200 mW/cm² for 40s in each region. Immediately after, the tooth was restored with A2B composite resin (Z350XT, 3M, Sumaré, SP, Brazil) to create a suitable and predictable format for prosthetic preparations, covering all exposed dentin (Figure 3C). Upon completion of the restorations, absolute isolation was removed, and the preparation was refined using #2135 and #2125F tips at high speed. Final finishing and polishing were achieved with low-speed sandpaper discs (SofLex Pop-On, 3M, Minnesota, USA) (Figure 3D).

Molding, mockup and cementing of prosthetic parts

Next, with the aid of a Suprafill spatula, a #00 separating wire (Ultrapack, Ultradent, Indaiatuba, SP, Brazil) was inserted to separate the gums vertically, as well as to help control the crevicular fluid. This was followed by definitive impression using dense and fluid addition silicone (Express XT, 3M, Minnesota, USA) using the double molding technique. The upper and lower functional models were sent to the prosthetics laboratory to create the working model. Subsequently, self-curing acrylic resin #66 (Dencôr, Artigos Odontológicos, Campo Limpo Paulista, SP, Brazil) was filled into the previously obtained mold and then adapted over teeth 11 and 21. The excess was removed using #1520 and #1251 burs attached to a straight handpiece. The provisional restoration was cemented (Hidro C, Dentsply Sirona, NY, USA) and the patient was released.

In the subsequent session, the provisional restoration was removed utilizing a crown remover (Kelly Hemostatic Forceps, Golgran, São Caetano do Sul, SP, Brazil). The dental preparations were then meticulously cleaned using a slurry of pumice and water applied with a Robinson bristle brush in a low-speed handpiece to ensure the complete removal of temporary cement residues. Immediately after, the mock-up test was performed using bis-acryl composite resin (Prisma #A2, FGM, Joinville, SC, Brazil). Approved by the patient not only in shape but also in size, and after the protrusive guide was checked, the laboratory was requested to make the pieces in lithium disilicate (IPS e.max Press, Ivoclar Vivadent, Germany) in the color selected initially. After 7 days, with the pieces ready on the functional model, which was cut to measure 2 mm in thickness, the cementation stages began (Figure 4A). Previously, a trial with transparent resin cement (NX3 Try-In Gel, Kerr, Biberach, Germany) was performed. From the trial, it was found that the naturalness was complete with the dental structure and harmonious in the smile (Figures 4B and 4C).

For cementation, absolute isolation of the operating field was performed in the same manner as previously described, however, with a medium-thickness sheet with highly flexible behavior (Flexi-dam, Coltene, Altstätten, Switzerland), complemented in the areas facing the gingival sulcus with teflon tape and using the same accessory clamps (Figure 4C). The pieces were positioned

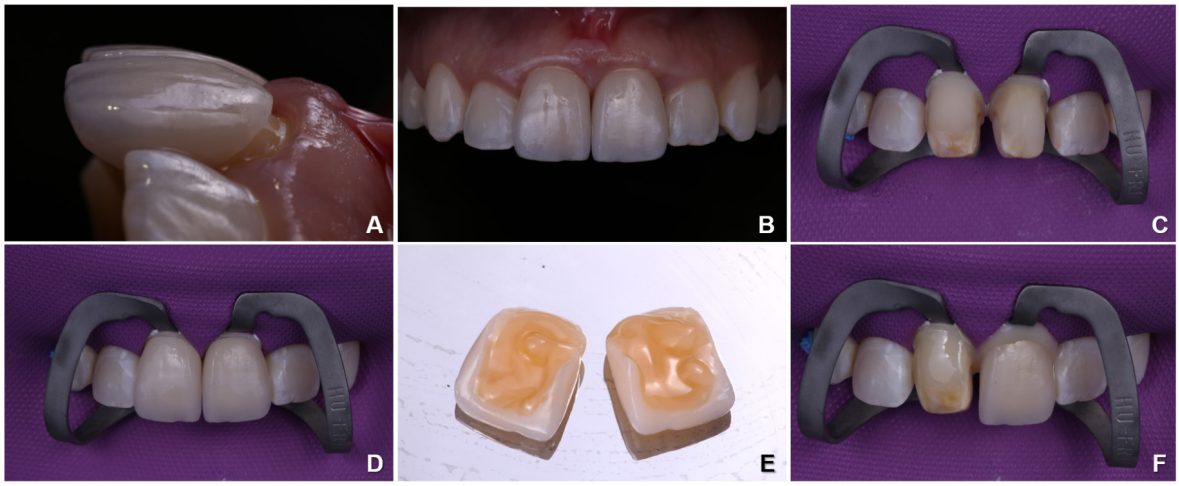


Figure 4 - (A) Piece adaptation test; (B) Fitting of the pieces; (C) Isolation of the operating field for cementation; (D) Dry fit of ceramic parts; (E) Acid etching on the pieces; (F) Cementation of the pieces.

again for post-isolation adaptation testing, where total adaptation to the cervical termination was observed (Figure 4D). Immediately afterwards, the surface was sandblasted, washed abundantly, conditioned with 35% phosphoric acid (Ultra-etch, Ultradent, Indaiatuba, SP, Brazil), followed by adequate washing and drying. Since the adjacent teeth were not conditioned for the cementation procedure, the teflon was removed to facilitate the correct seating of the pieces. Upon completion of this step, a layer of bond (Optibond FL, Kerr, Biberach, Germany) was applied, removing its excesses without photoactivation.

To prepare the pieces, they were conditioned with 5% hydrofluoric acid (Condac Porcelana, FGM, Joinville, SC, Brazil) for 20s (Figure 4E) [11]. The pieces were rinsed with a water jet and dried with an air jet. Subsequently, silane (Silane Primer, Kerr, Biberach, Germany) was applied to the internal surface with the use of a micro-applicator, waiting 5 minutes for volatilization according to the manufacturer's instructions, inserting resin cement in the color "yellow" (Nx3 Light Cure, Kerr, Biberach, Germany) inside the pieces, followed by adaptation on the prepared teeth (Figure 4F). The excess cement was removed with the help of a #608-000 ceramic brush, followed by photoactivation on all sides for 40s each.

After the cementation was completed, the absolute isolation was removed and the patient was released (Figure 5A). After 7 days, the patient returned expressing total satisfaction with the result obtained. In addition, the adaptation of the periodontal tissues underlying the pieces is worth noting, resulting in greater naturalness (Figure 5B). This high level of patient satisfaction was likely achieved through the restoration of smile harmony, which was carefully aligned with the principles of the golden proportion (Figure 6). Subsequent to the 36-month follow-up period, the success of the proposed treatment was evident (Figures 7A, 7B, 7C). The angle of the pieces was in total mimicry of the oral tissues since the esthetic/functional pattern was presented by the

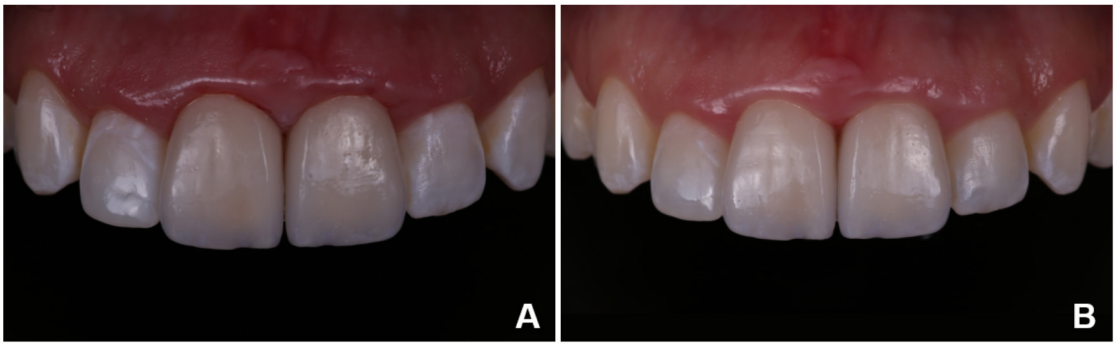


Figure 5 - (A) Immediate appearance after cementation; (B) Clinical aspect after 7 days.



Figure 6 - Before-and-after analysis of anterior tooth proportions and smile architecture. Post-treatment reshaping of the maxillary central incisors resulted in a more favorable incisal curvature and relationship with the lower lip. Resolution of gingival inflammation was associated with a more favorable upper-lip position and reduced gingival display, as highlighted by the white reference line. The relative apparent widths changed from 16.6%, 21.1%, 21.1%, and 17.0% before treatment to 16.4%, 21.3%, 21.3%, and 16.4% after treatment, demonstrating greater bilateral proportional symmetry. Collectively, these changes resulted in a more balanced dentogingival and labial architecture.

periodontal health and patient satisfaction was stabilized.

This follow-up examination was conducted using a UNC-15 probe (PCP UNC-15, Hu-Friedy®, Chicago, USA), clinical photographs (from multiple perspectives), and cone-beam computed tomography (CBCT) scans. Clinical evaluation (Figure 7) showed resolution of the previously observed erythema and edema (Figure 1C). Periodontal health was reestablished, with a PD of 3.0 mm and absence of BoP at both teeth #11 and #21. Moreover, CBCT analysis revealed no excessive cervical ceramic contour or violation of the supracrestal tissue attachment (Figures 8A and 8B), and patient feedback, which indicated an absence of bleeding, the resolution of halitosis, comfort when smiling, and an improved quality of life. The patient remains under long-term monitoring following the anterior crown replacement. Her adherence to periodic dental follow-ups will contribute to a more reliable longitudinal assessment of the clinical outcomes.

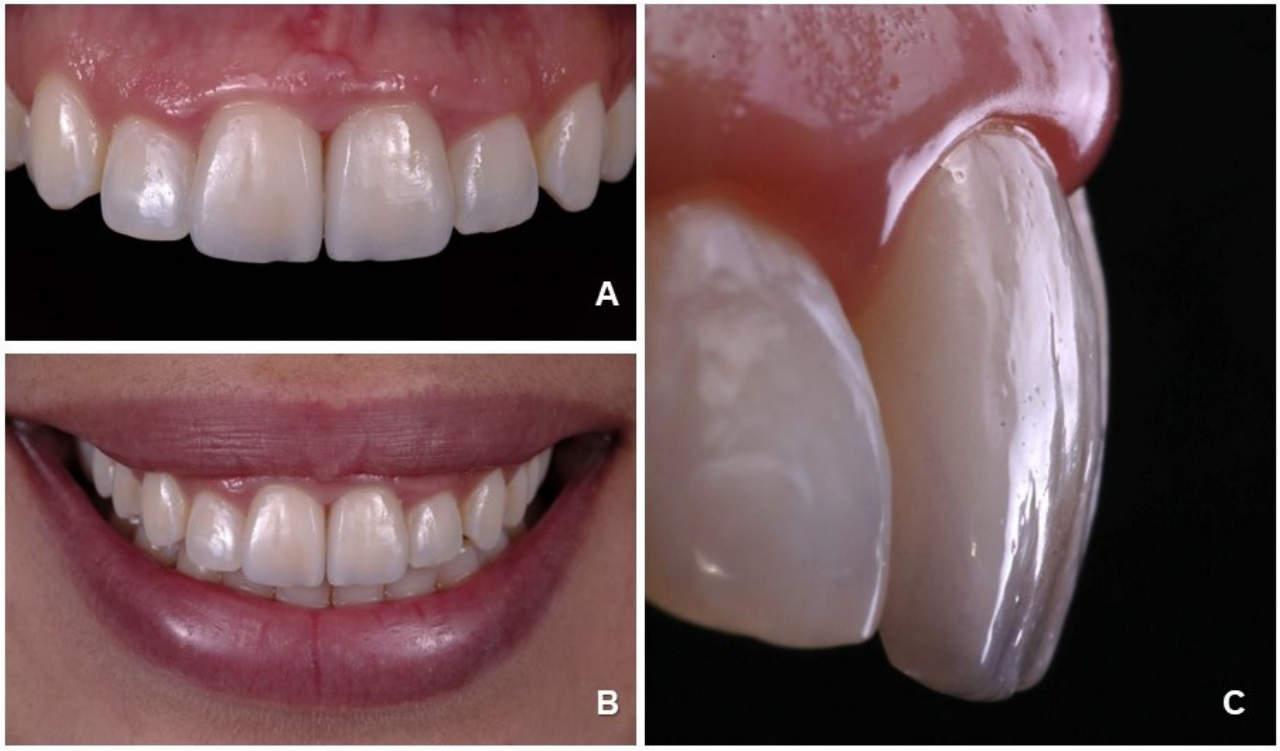


Figure 7 - (A) Final appearance after 36 months; (B) Appearance of final smile after 36 months; (C) Balance of tooth and periodontium in lateral view.

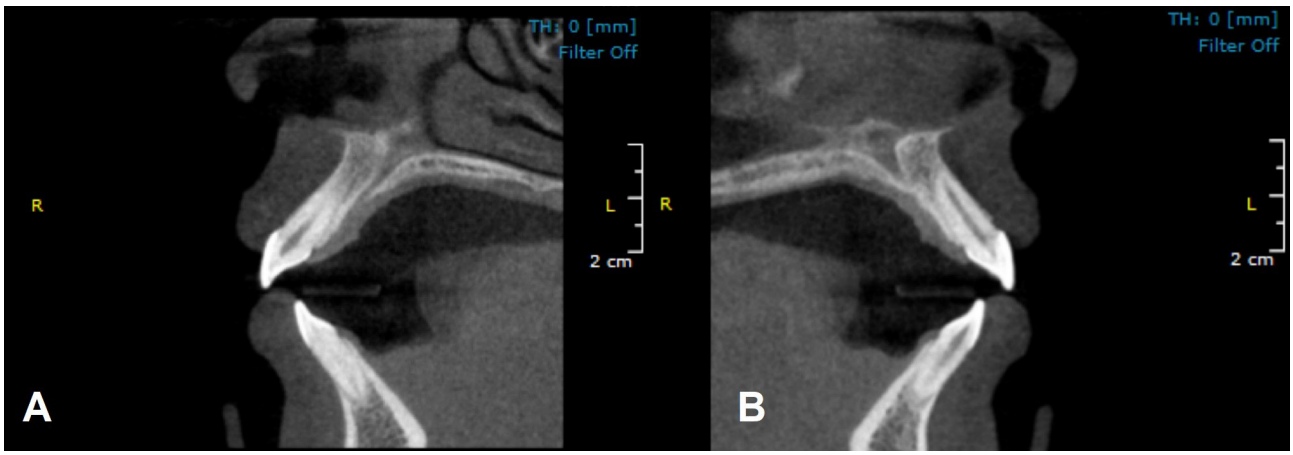


Figure 8 - Cone-beam computed tomography (CBCT) analysis showing the relationship between the restoration and the supracrestal tissue attachment. (A) Cross-sectional image of tooth #11; (B) Cross-sectional image of tooth #21.

DISCUSSION

The placement and replacement of crowns constitute a considerably high percentage of daily dental services. The decision to indicate a crown for a tooth can affect the long-term prognosis of the tooth, the cost of the proposed procedure, and the expected lifespan of the tooth/restoration [6,11]. According to Uzgur et al. [12], the main reason for the first restoration and single crowns is related to endodontic problems (26.5%), followed by aesthetics (21.2%), primary caries (17.7%), and failed restorations (10.6%). On the other hand, the most common reason for crown replacement is directly related to endodontic problems (26.5%) followed by unacceptable marginal adaptation (17.8%). In the presence of failures in rehabilitative procedures, prosthetic reintervention is an effective method for restoring smile harmony, as long as it respects contours, tissue terminations, and supporting structures [7,12].

Factors reported as potential periodontal aggressors include: subgingival margin placement of restorations, overhangs, dental material characteristics, gingival displacement procedures, periodontal phenotype, emergence profile, and biological width (supracrestal tissue attachment) [10]. In this context, prosthetic rehabilitation, with an emphasis on restoring the appropriate emergence profile, even with a subgingival margin, resin cement, and ceramic material, has played a crucial role in promoting periodontal health and that the position of the new contact point was responsible for greater papilla filling of the embrasure [1,8].

The favorable outcome and predictability achieved in this clinical case [7,13] are directly attributed to the precise execution of the surface conditioning and isolation protocols. Here, the use of aluminum oxide blasting served a dual, case-specific purpose: ensuring complete decontamination of the tooth substrate after removing the old veneers, and optimizing the internal surface of the prosthetic pieces prior to silanization [14,15]. Crucial to the success of these steps, opting for absolute isolation with a rubber dam during various critical stages from gingival retraction and substrate preparation to final cementation effectively sealed the operative field against any fluid contamination [16-19]. Rather than just following standard guidelines, this meticulous maneuver was a determining factor in preserving bond integrity, directly influencing the optimal aesthetic and functional results presented.

When comparing the initial and final photos, we can observe the aesthetic restoration following the principles of the golden ratio, making the smile visually more pleasant, and the maintenance of disocclusion guides, which may contribute to the long-term success of the restorations. Furthermore, the final result met the patient's expectations. Mazzetti et al. [20], further reinforce that ceramic restorations have good longevity with the permanence of the main aesthetic aspects over time. In the clinical case presented, periodic monitoring was performed in order to verify the balance between the periodontium and the prosthetic piece, restoring the health relationship in the oral environment.

However, when managing prosthodontic reinterventions in young individuals presenting with aesthetic disharmony and periodontal disorders, the clinical approach demands an extremely cautious and biologically conservative perspective. In young patients, the dentin-pulp complex and periodontal tissues exhibit high responsiveness and long-term vulnerability. Therefore, prior to choosing invasive procedures, it is fundamental to prioritize strict periodontal health control, the reestablishment of biologic width when needed, and the application of biomimetic and minimally invasive concepts. Treatment planning must consider that the target teeth will undergo multiple restoration cycles throughout the patient's lifetime, making the preservation of sound tooth structure the most critical factor for the long-term prognosis [4,21-23].

Based on the comparative visual analysis and the established principles of dental aesthetics, the post-treatment outcomes demonstrate a significantly superior harmonization that strictly aligns with the mathematical concepts of the golden proportion [24,25]. In the baseline condition, an evident disproportion was observed regarding the width-to-height ratio of the maxillary central incisors (teeth 11 and 21).

These teeth exhibited a predominantly square morphology, short in the cervico-incisal dimension, which culminated in reduced visual dominance and compromised the overall aesthetic flow of the smile [25]. Following the prosthetic replacement of the crowns, an evident restoration of the ideal parameters described in the contemporary literature was achieved. The anatomical redesign of elements 11 and 21 permitted the elongation of the clinical crown and the re-establishment of

an optimal width-to-height ratio, falling within the ideal 75% to 80% threshold [26].

This dimensional realignment successfully restored the visual dominance of the central incisors within the anterior maxillary framework, establishing them as a harmonious focal point [27]. Furthermore, the intervention resulted in a smoother, more balanced progression of the apparent widths in the frontal view. The visual proportion of the maxillary central incisor relative to the adjacent lateral incisor was evaluated in relation to the mathematical golden ratio, in which the central incisor represents 1.618 relative to the lateral incisor taken as 1.0. The mean central-to-lateral apparent width ratio increased from approximately 1.25:1 before treatment to 1.30:1 after treatment, indicating a numerical shift toward, although not reaching, the theoretical golden ratio and enhancing the visual dominance of the maxillary central incisors. [27,28]. This dimensional equilibrium was further enhanced by substantial improvements in the gingival architecture and the emergence profile of the new prosthetic crowns. Consequently, the alignment of the anterior dentition perfectly complemented the curvature of the lower lip during a smile, as illustrated in Figure 6, generating a more dynamic, symmetrical, and aesthetically pleasing smile line [29,30].

As limitations of this study, it must be highlighted that the observed clinical success and outcomes rely on a single case report, which precludes the generalization of findings or the establishment of universal clinical guidelines. Furthermore, although quantitative periodontal data were recorded and demonstrated a harmonious relationship and initial stability within the 36-month follow-up, this period is still limited for a comprehensive assessment of long-term periodontal stability and predictability. Therefore, fully evaluating the true longevity and long-term failure rates of the proposed approach will require not only a more extended monitoring period of the current case but also the implementation and prospective follow-up of additional clinical cases.

CONCLUSION

The presence of a gap between the restorative material and the gingival margin was a predisposing factor for the development of gingivitis, evidenced by tissue edema and bleeding upon probing. Despite periodontal limitations, restorative procedures were able to act on injuries and promote tissue health in accordance with the principles of the binomial form/function.

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DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author's Contributions

JPSJ: Writing – Original Draft Preparation, Writing – Review & Editing, Investigation. CMJ: Conceptualization, Methodology, Validation. RCVB: Writing – Original Draft Preparation, Writing – Review & Editing, Resources. VGC: Visualization, Data Curation. AR: Funding Acquisition. PHCOP: Project Administration, Validation. SEPG: Project Administration, Validation, Supervision.

Conflict of interest

No conflicts of interest declared concerning the publication of this article.

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Regulatory Statement

Given that the patient signed the Informed Consent Form, as stated in the text, approval from the Research Ethics Committee (CEP) was waived.

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Jefferson Pires da Silva Júnior

(Corresponding address)

Universidade Federal do Amazonas, Manaus, AM, Brazil.

Email: jefferson.junior@ufam.edu.br

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