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Volume 3, Number 2

Summary
Contents

Editorial

Dentistry for pregnant women is the next step
Andréa Fonseca Gonçalves ---------- **1**

Original Article

Prosthetics on implants: cement or screw-retained? A review of the literature.
Viviane Cristine Ferreira Lahmeyer Fellows, Adriano Relvas, Pablo Sotelo, Marcos Venício Rocha de Azevedo, Mauro Lefrançois, Laura Sotelo ---------- **2**

The applicability of the Nicodemo, Moraes and Médici Filho's method (1974) for age estimation among children, adolescents and young adults: a systematic review.
Lidiane Gonçalves do Nascimento, Lucas Pereira Borges, Johnys Berton Medeiros da Nóbrega, Raphael Cavalcante Costa, Bianca Marques Santiago ---------- **8**

Oral Health of Individuals with Mental Health Disorders.
Tamara Latif e Alexandre R. Vieira ---------- **19**

Osteoporosis, tooth loss and functional dentition in elderly women: a cross-sectional study.
Daniela Cia Penoni, Sandra Regina Torres, Mario Vianna Vettore, Anna Theresa Thomé Leão ---------- **26**

Accuracy of the initial diameter of finishing files and gutta-percha cones of the ProTaper Universal® system.
Manoela Teixeira de Sant'Anna Dadalti, Fabíola Ormiga, Marcos César Pimenta de Araújo, Patrícia de Andrade Risso - **32**

Case Report

Multidisciplinary aesthetic rehabilitation: case report.
Juliana Costa Pereira Baia, Mariángela Ivette Guanipa Ortiz, Gustavo Antônio Martins Brandão, Armando Rodrigues Lopes Pereira Neto, Jesuina Lamartine Nogueira Araújo, Cecy Martins Silva ---------- **37**

Candida spp. in linear gingival erythema lesions in hiv-infected children: reports of six cases.
Maristela Barbosa Portela, Daniella Ferraz Cerqueira, Renato Vieira de Paiva, Adrielle Mangabeira Santos, Tamiris Ramos Vargas, Gloria Fernanda Castro ---------- **42**

Erosive tooth wear in an asthmatic child: a case report.
Nicole Marchioro dos Santos , Ingrid de Lima Flores, Adriela Azevedo Souza Mariath, Jonas Almeida Rodrigues --------- **47**

Tissue healing with polypropylene membrane used as conventional guided bone regeneration and exposed to the oral cavity for post-dental extraction: a case report.
Thiago Henrique Esch, Davi da Silva Barbirato, Mariana Fampa Fogacci, Otto de Oliveira Magro, Maria Cynésia Medeiros de Barros ---------- **52**

Three year follow-up and management of a severely dislocated tooth after primary trauma.
Adílis Kalina Alexandria, João Alfredo Farinhas-, Daniela Novaes Soares, Thais Pinto Alves, Laura Salignac Guimarães Primo ---------- **57**

Multidisciplinar aesthetic dental rehabilitation using prefabricated composite resin veneers after orthodontic treatment.
Cláudia Callegaro de Menezes, Nathara Máximo Moreira Cardoso, Lincoln Moreira Mendes, Hana Fried, Gisele Damiana Da Silveira Pereira ---------- **61**

Bulk-fill resins in pediatric dentistry: case reports with six-month follow-up.
Aline Borburema Neves, Ana Carolina da Matta Lessa, João Victor Frazão Câmara, Andrea Vaz Braga Pintor, Aline de Almeida Neves ---------- **65**

Skeletal Class III malocclusion in conjunction with early childhood caries increases orthodontic treatment complexity: A case report.
José Valldares-Neto, Cristiane Barbosa dos Santos, Breno Soares Arruda, Ilda Machado Fiuza Gonçalves ---------- **72**

DENTISTRY FOR PREGNANT WOMEN IS THE NEXT STEP

Despite the incredible advances that have been made in dentistry in the past years, preventive dentistry still seems to be a secondary priority. Rather than primarily focusing on treating oral diseases such as dental caries and periodontitis, prevention should be emphasized as indispensable.[1] Thus, good general and oral health begins when the future mother, still pregnant, strives to remain healthy, so that she can receive her baby with health and habits of life that lead to good health – extended to the whole family, since the excellent moment in which the family are opened to receive information. Therefore, a dental prenatal is extremely important and should be stimulated among pregnant women, either for their own care or to receive guidance for their babies.

According to the literature, the need of dental care for pregnant women as an integral component of the prenatal care program remains to be an important issue. Although a non-robust evidence was found, there are the hypothesis of periodontitis as an independent risk factor of preterm birth and preeclampsia.[2,3] Adverse birth outcomes are traumatic, since preterm birth is the second leading cause of death in children under five; and, preeclampsia, a maternal multi-organ disease that clinically manifests in the second half of pregnancy with the appearance of hypertension and proteinuria, is one of the leading causes of maternal morbidity and mortality in the Western world.[3]

Oral health of pregnant women is considered almost always unsatisfactory, particularly among those of low socioeconomic status.[4] Despite that, generally they are often eager for information on the best care for their future babies. We know that early childhood caries (ECC) is a major global public health issue, which affects 5–94 % of 1- to 5-year-old children worldwide, who suffer from dental pain, and difficulties with eating, speaking and socializing,[4] therefore pregnant women need to be educated regarding the possible impact of ECC on the quality of life of their babies and family. Thus, pregnant woman is a key person in preventing dental decay in infants.

Dentists should pay special attention to the pregnant woman, implementing a prenatal dental program in their area of work, encouraging and guiding these women about their own oral hygiene and of their future baby, for the prevention of diseases.

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PROSTHETICS ON IMPLANTS: CEMENT OR SCREW-RETAINED? A REVIEW OF THE LITERATURE

Viviane Cristine Ferreira Lahmeyer **Fellows**[1], Adriano **Relvas**[1], Pablo **Sotelo**[1], Marcos Venício Rocha de **Azevedo**[1], Mauro **Lefrançois**[1], Laura **Sotelo**[1]

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Palavras-chave: Implantes Dentários. Prótese Dentária. Retenção de Prótese.

RESUMO

Introdução: A descoberta de implantes osteointegrados de titânio possibilitou o desenvolvimento de próteses dentárias parafusadas ou cimentadas. No entanto, cada método de retenção envolve diferentes aspectos. **Objetivo**: este estudo tem como objetivo revisar a literatura de estudos in vitro e in vivo dos últimos 7 anos sobre as propriedades mecânicas, biológicas, estéticas e oclusais e o custo de próteses parafusadas e cimentadas para identificar o que pode promover maior longevidade e economia, considerando o quadro clínico do paciente. **Fontes de dados**: Nosso método foi baseado na coleção de artigos científicos publicados em inglês de 2012 a 2018 no banco de dados PubMed. **Síntese dos achados**: notamos que em alguns casos clínicos, um método de retenção foi mais adequado que o outro, como visto no acesso à região posterior ou na face palatina das coroas, a posição / angulação dos implantes na região anterior , saúde do paciente e condições econômicas. Ambas as próteses podem sofrer ou não de complicações mecânicas e biológicas. A reversibilidade também pode ser associada a próteses cimentadas. Existem alternativas às próteses parafusadas para alcançar uma estética satisfatória na região anterior, apesar de serem mais caras. A oclusão ideal tende a ser mais facilmente alcançada por próteses cimentadas, pois evita parafusos protéticos e a formação de orifícios coronários, apesar das contribuições do planejamento correto, seguido pela análise de oclusões estáticas e em movimento. **Conclusão**: cada método de retenção tem suas vantagens e desvantagens. Portanto, o melhor método é aquele que melhor se adapta às características e necessidades de cada paciente.

Keywords: Dental Implants. Dental Prosthesis. Prosthesis retention.

ABSTRACT

Introduction: The discovery of titanium osseointegrated implants enabled the development of screw or cement-retained dental prostheses. However, each retention method involves different aspects. **Objective**: this study aims at reviewing the literature of *in vitro* and *in vivo* studies of the last 7 years on the mechanical, biological, aesthetic and occlusal properties and the cost of screw and cement-retained prostheses to identify what can promote greater longevity and economy by considering the patient's clinical framework. ***Data sources:*** Our method was based on the collection of scientific articles published in English from 2012 to 2018 in the PubMed database. ***Summary of the findings***: we noted that in some clinical cases, a retention method was more appropriate than the other, as seen in the access to the posterior region or the palatal face of the crowns, the position/ angulation of implants in the anterior region, the patient's health and economic conditions. Both protheses can suffer or not from mechanical and biological complications. Reversibility can also be associated to cement-retained protheses. There are alternatives to screwed prosthetics to achieve satisfactory aesthetics in the anterior region despite being more expensive. Ideal occlusion tends to be more easily achieved by cemented prosthesis as it avoids prosthetics screws and the formation of crown holes, despite the contributions of correct planning followed by the analysis of static and in motion occlusions. **Conclusion**: each retention method has its advantages and disadvantages. Therefore,the best method is the one that best fits the characteristics and needs of each patient.

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INTRODUCTION

The number of the older population is growing in Brazil.[1] In this context, health professionals must contribute to the provision of education and prevention programs in oral health, as edentulism is still seen as a normal consequence of aging, not of lack of care, leading to caries and periodontal diseases, complications that most contribute to the loss of dental elements. [2]

However, partial or total loss of dental elements not only affects the older populations but also the Brazilian adult population. In a study Medeiros *et al*. found a prevalence of 91% of edentulism between 64 adults aged between 35 and 44 years, in the municipality of Bayeux, Paraíba. Prevalence was measured independently of social classes or conditions of access to the dentist for periodic preventive measures. But most of them reported only reaching out for professional help when in need for extractions and orthodontic treatments, rather than preventive care. [3]

Osseointegrated implants were developed to recover the smile, the phonation and the masticatory capacity of patients partially or totally edentulous.[4] Currently, immediate implants prevent patients from reaching these conditions. Osseointegration was proven by Per Ingvar Bränemark, in 1969, when using titanium implants after one decade of studies about it. The material showed biocompatibility, resistance and low corrosive potential compared to others previously used such as aluminum, copper, chrome, vanadium.[5]

Logically, the discovery has contributed to the development of screwed prostheses by Bränemark in the same decade.[6] Then came the cemented prostheses.[7] Each case must be carefully analyzed for correct indication. In addition, the range of cementing agents, as well as of abutments and screws has been generating questionings regarding the type of prosthesis that confers minor complications and greater durability.[8]

Faced with the success of dental implants, proven in the literature,[9] in 2013, the Accreditation Commission Dental required the inclusion, at graduation in Brazil, of dental implants as another treatment option for patients. [10] This fact tends to increase the access of patients to this modality of treatment.

Hence, this article aims to review the literature of in vitro or in vivo studies of the past seven years on the mechanical, biological, aesthetic and occlusal properties, and the cost of the screw and cement-retained prostheses and to identify the aspects that might promote greater longevity and economicity by considering the patient's clinical framework.

Study design

Electronic searches between 2012 and 2018 were conducted using the *U.S National Library of Meidicine/ National Institutes of Health* search portal (PubMed) and made available free of charge by the Coordination for the Improvement of Higher Education Personnel (CAPES). The searched terms were "screw-retained implant crowns", "screwed implant crowns"; "cement-retained implant crowns", "cemented implant crowns"; limited to the *text words* field. The search strategy used was (screw-retained implant crowns AND cement-retained implant crowns); (screw-retained implant crowns AND cemented implant crowns); (screwed implant crowns AND cement-retained implant crowns); (screwed implant crowns AND cemented implant crowns). A 10-year publication filter was applied. It was verified by one review author (VCFLF) if titles and abstracts of the studies identified through the research strategy were appropriate to the objectives of this study and followed the selection criteria. The studies were selected according to the following criteria:

- Publication date between 2012 and 2018 to ensure that all the data considered in this study are contemporary.
- Publication in English;
- *In vitro* or *in vivo* studies (case, randomized and comparatives) in humans;
- Study of systematic review/meta-analysis, to expand the number of articles.

Synthesis of data

Initially, 188 references were retrieved from PubMed. After the application of a 10-year post-publication limit, 150 papers remained, and based on the inclusion and exclusion criteria, 59 studies from PubMed made available free of charge by CAPES were selected. Following a full reading of the papers, 25 were included in this study. Articles and books outside this search methodology were used to compose the introduction.

Summary of the findings

With the discovery of osseointegration through titanium implants, thanks to biocompatibilities of this material, by Bränemark at the end of 1960, the partial or total rehabilitation of edentulous people became possible by means of retained implant prostheses, providing a long-lasting treatment to patients. [5]

According to the literary review, mechanical complications were more incident among users of single screwed prostheses, such as retention loss or passivity, regardless of the type of screw (conventional or lateral).[11-14]

Shadid and Sadaga [15] corroborate with these findings,

stating that screwed protheses tend to suffer from losses in passive adaptation because of its own architecture, as they need a screw to attach the abutment to the implant and another one to retain the crown on the abutment. Prosthetic misfit can also occur when there is tension during repair completion. The lack of space between the abutment and the crown and the contact between metals without the use of a cementing agent makes it necessary to ensure the accurateness of prosthetic fit, which is difficult to achieve. And although gold screws may confer better clenching and retention than those manufactured with titanium, small changes in the metal-to-metal interface are produced in each adjustment, increasing stress concentration on implants and the chances of screw loosening, fracture of prosthetic components or of the prosthesis itself, implant loss; inflammation of peri-implant tissues and bone resorption.

Because of the lack of access to the screw hole in the occlusal surface of cemented prosthesis, the implant tends to suffer from loads in the axial direction instead of the lateral one, which reduces the risk of screw loosening and fracture or failure of prosthetics components.[15,16] The same occurs due to the direct contact between metal and ceramic in cemented-retained prostheses. In other words, there is no need to fill the access hole with resin or composite, which suffer from greater wear from friction. Although the methyl methacrylate-based resin with 4-metacriloxietil has been shown to be superior to the photopolymerized nano-hybrid composite resin concerning integrity maintenance of the surface of the access hole filled with screwed prostheses, there is need to analyze investigations with more than 12 months long to confirm such findings.[17] The lateral screws installed in the palatal face of crowns of screwed prostheses did not reduce the occurrence of loose screws,[14] In this sense, on the one hand, Kosmin *et al*. [18] showed the possibility of combining the use of both forms of prosthetic retention. Screwed prostheses can receive lower hardness cementation to confer further strengthening against unwanted movements, adaptation loss and screw loosening, besides maintaining reversibility and providing best aesthetic results.

On the other hand, Vigolo *et al*. [19] found no mechanical complications between protheses retained by the two methods for 10 years, suggesting the importance of planning and using components that confer adequate adjustment to implants for each type of prosthetic retention, such as golden UCLA in screwed prostheses or customized with noble alloys in the cement-retained ones and golden screws in both.

The presence of an access hole to the screw in the occlusal surface of screwed restorations significantly reduces ceramic resistance to fractures, as the head of the screw or the restorative composite material with which part of the hole is covered occupies from 50% to 66% of intercuspal distance.[20] In other words, there is still a minimum width of ceramics around the opening access to the screw that increases the chances of fracture. In addition, the remaining hole indicates the interruption of structural continuity of ceramics, leading to changes on its center positioning through which the material choses during the sintering process. Thus, ceramics behavior becomes more sensitive when in screw-retained protheses than in the cemented ones. However, Ferreiroa *et al*. [21] verified similar occurrence of ceramic fracture of cemented and screwed crowns. Thus, it is possible to use both types of retention in the region of the mandibular molar according to the authors The evaluation of the static and in motion occlusion, i.e. considering the changes in the patient's occlusal contacts can help avoiding ceramic fracture.[19]

When it comes to biological complications, we observed more problems of this nature among cemented prostheses when compared to the screwed ones.[11,20,21] For this reason, Sailer *et al*. [11] raised the possibility of screwed protheses becoming the most popular even if both methods had presented high survival rate, which makes it harder for us to define the best option. In addition, other studies [19,23,24,25] did not observe significant difference between retention methods when considering marginal bone resorption, as they are within normal standards, which reinforces the importance of complete subgingival removal of cement excesses to prevent peri-implantitis and marginal bone loss.

For that, we recommend the conduction of an X-Ray, a less invasive procedure, to identify the amount of cement excess as sometimes it is not possible to detect it only through clinical examination.[26] But when the excess of difficult detection due to overlapping or facial implant surface location, we recommend the use of radiographic tracking markers. It was not possible to determine the most adequate method for excess removal when choosing between dental endoscope or open flap debridement. Therefore, the choice depends on the professional's familiarity with the technique.[27] Cementing with the use of a device built based on the internal structure of the crown [27] or the duplication of the abutment for cement flow control [28] are welcome, as they can reduce cement excess after crown fixation, both being procedures

of quick and easy implementation and low cost.

When it comes to reversibility, several authors point it out as an important feature of screwed prostheses.[15, 16] Manawar *et al*. [16] highlighed the risk of fracture of cemented prostheses during cement removal for cleaning or repairing, Alavarez-Arenal *et al*.,[29] mentioned cements of glass ionomer, compomer and urethane-based resin as possible alternatives in these cases, despite these being resistant. It is worth to remember that abutments made of titanium are generally used in cemented prostheses.[27] In order to solve this situation, cases where the margin of the prosthesis on the implant is located in a place of difficult access, it would be more indicated screwed protheses.

Regarding the manufacturing cost, cemented prostheses require less laboratory complexity when compared to the screwed ones, and have less prosthetic components, such as the abutment to be attached to the implant and the crown that goes over it. Prosthesis cementing occurs in the abutment, dispensing prosthetic screws to attach the abutment to the prosthesis.[16,31] Costs also vary depending on the alloy material (e.g. gold) used for making cemented prosthesis, as they allow the use of abutments of titanium, ceramics/zirconia, of lower cost compared to the UCLA gold.[30]

When it comes to aesthetics, there are no pre-angulated abutments with less than 17 degrees to correct certain axial divergencies in implants with screwed prostheses.[16] Thus, cemented protheses are more adequate to solve the inclination problem and avoid the vestibular installation of implants, which can negatively affect aesthetics, considering the cement covers the crown/abutment interface, dismissing the use of a second screw (prosthetic) and the formation of an access hole in the crown.[28,31]

Cemented protheses also allow the use of ceramics/zirconia abutments in cases of higher aesthetic need, such as cases involving the anterior region or when the gingival biotype is thin or has irregular contours. These abutments, as the ones made of titanium, can be pre-angulated and allow the correction of up to 25 degrees of inclination. The UCLA abutment in gold can also be used, as in screwed prostheses. Aesthetic is conferred to it after coverage with calcinable plastic, but it presents limited angulation, not tolerating divergences in implant axes; while conic abutments, used in screwed prostheses, allow the correction of bigger divergencies, despite not being adequate for patients with less than two millimeters of thickness of soft tissues for aesthetic reasons.[30]

To fill access holes to the screw, we recommend state of the art resins whose greater opacity can block light and hide the shadow of the screw that confers a grayish color to the screwed prosthesis. But its effectiveness is not 100% guaranteed in the long term. Coloration did not change significantly when using the photopolymerized nano-hybrid composite resin and methyl methacrylate-based resin with 4-metacriloxietil (M4M).[17] However, the duration of the investigation was only of 12 months. So, the ceramic plug was presented to work as a cover for the screw access hole sinalized and conditioned with hydrofluoric acid, allowing the integration between the filling resin and the crown ceramics.[32]

Professionals find it easier to use cemented prostheses for its greater accessibility even in the posterior regions, dismissing the use of small screwdrivers for screw placing and adjusting.[28,32] This way, Assaf and Gharbyeh [33] have recommended cemented prostheses in cases that the access hole to the screw is more vestibularly located or when the access to the posterior region hinder the conduction of adjustments.

It is hard to achieve ideal occlusion when using screwed protheses because of divergences in implant axes. Vigolo *et al*. [19] showed the manufacturing of abutments for cemented protheses aimed at correcting angulations of 12 degrees in implant axes. Manawar *et al*. [16] mentioned the lack of pre-angulated abutments with less than 17 degrees for screwed prostheses.

Still according to the authors, it is necessary to place the implant at the central tanks to generate a load at the axial direction of posterior teeth. But in screwed prostheses, the hole of access to the screw occupies 50% of occlusal table of molars and more than 50% of the occlusal table of premolars.[16] Furthermore, the restorative material used to cover the hole of access to the screw, just like composite resin, can suffer from deformation caused by occlusal loads, modifying the surface of the filled hole [14] and the direction of these loads, distributing them as lateral forces instead of axial ones to the implant, which increases the chance of fracture in the crown or prosthetic components.[15] Lateral or transverse TS screws can be used, but do not prevent the mechanical complications in screwed protheses, also being limited to patients with good access to the palatal region. Hence, the cemented prostheses may have more advantages, ensuring the stability of occlusal contacts for many years.[14,16,34]

Table 1: - *Summary of advantages and disadvantages of cemented and screwed protheses*

	Screwed Prostheses	Cemented Prostheses
Mechanical Complications	Losses in passive adaptation; Risk of screw loosening; Risk of fracture or failure of prosthetics components; Access hole to the screw reduces ceramic resistance.	Loads in the axial direction instead of the lateral one;Lower risk of screw loosening, fracture or failure of prosthetics components.
Biological Complications	No risk of excess cement causes peri-implantitis and marginal bone loss.	Importance of complete subgingival removal of cement excesses.
Reversibility	Possibility of unscrewing the crown at any time.	Difficulty of removing the crown in case of fracture of the prosthesis Cost
Cost	Greater laboratory complexity.	Less prosthetic components.
Aesthetic	Need to use a higher opacity resin that blocks light and hides the shadow of the screw that confers a grayish color to the screwed prosthesis	Cemented protheses are more adequate to solve the inclination problem; Dismiss the use of a second screw (prosthetic) and the formation of an access hole in the crown.
Ideal Oclusal	Divergences in implant axes become hard to achieve ideal occlusion.	Manufacturing of abutments for cemented protheses aimed at correcting angulations of 12 degrees in implant axes.

CONCLUSION

According to this review of the literature, it was possible to conclude that:

• Screwed prostheses may present further complications, such as screw loosening, ceramic fracture; while the cemented ones can present biological complications such as peri-implantitis and marginal bone resorption. However, this can be avoided with proper care during planning.

• Screwed prostheses are more advantageous when it comes to reversibility, but the cemented ones can also be reversible with the use of cements of smaller tenacity, such as glass ionomer, compomer and urethane-based resin. The bond between cement and titanium not necessarily hinders its removal. The use of less resistant cement in cementeded prostheses can improve retention without impairing reversibility.

• Cemented prostheses are more aesthetic as they dismiss the use of screws in the abutment-crown interface, besides having the possibility of employing aesthetic abutments made of ceramics/zirconia in the anterior region. For screwed protheses, there are some options for the correction of vestibularized installation of implants in the anterior region, such as UCLA calcinable abutments and the manufacturing of a metal substructure with ceramics vestibular face. Despite the existence of aesthetics resin to fill the access hole, the ceramic plug shows better results.

• Cemented protheses have lower manufacturing cost because of the inferior amount of used components. The use of abutments of titanium, of lower cost, is one of the most common. Screwed protheses, however, require gold abutments for better retention, which are way more expensive.

• Cemented protheses contribute to the achievement of ideal occlusion, as screws of the abutment/crown interface of screwed protheses can not correct all the discrepancies in implant axis. TS transversal screws can be a solution, but there is still need for a good palatal access.

• There is no retention method better than the other. Each one of them has its own advantages and disadvantages. Choice must be made based on the professional's preference and experience and on the patient's the needs.

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THE APPLICABILITY OF THE NICODEMO, MORAES AND MÉDICI FILHO'S METHOD (1974) FOR AGE ESTIMATION AMONG CHILDREN, ADOLESCENTS AND YOUNG ADULTS: A SYSTEMATIC REVIEW

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Palavras-chave: Determinação da Idade Pelos Dentes. Odontologia Forense. Revisão Sistemática.

RESUMO

Objetivo: Avaliou-se a aplicabilidade da Tabela Cronológica de Mineralização dos dentes permanentes em Brasileiros para estimativa da idade com fins forenses, por meio de uma revisão sistemática. **Método:** A pesquisa foi desenvolvida baseada no protocolo do *Preferred Report of Systematic Reviews and Meta-Analysis* (PRISMA). As buscas foram realizadas nas bases de dados: Web of Science, Pubmed, Scopus, Cochrane, Lilacs e Sigle, sendo a estratégia baseada no acrônimo PICO/PECO (MAIA; ANTONIO, 2012). **Resultados:** Foram recuperados 10.280 registros nas referidas bases, e após a triagem inicial 20 artigos seguiram para leitura na íntegra. Ao final, permaneceram 5 artigos e mais um foi adicionado por *hand searching*, perfazendo 6 artigos. Os estudos apresentaram delineamento seccional, sendo cinco realizados no Brasil e dois no exterior. A avaliação da qualidade metodológica, realizada com o auxilio do QUADAS adaptado por Lopes (2012), indicou que os 6 estudos apresentaram mais de 50% das respostas positivas, sendo que um atendeu a todos os requisitos. Para comparar as idades estimada com a cronológica, 4 dos artigos utilizaram análise de correlação e os demais, estatística descritiva. Os resultados demonstraram discrepâncias entre a idade estimada e a cronológica, fazendo com que a maioria dos autores indicasse o uso parcimonioso do método, procurando utilizar fatores de correção para populações específicas ou a sua associação a outros métodos de estimativa de idade. **Conclusão:** A evidência científica acerca da aplicabilidade do método de Nicodemo, Moraes e Médici Filho (1974) na estimativa de idade com fins forenses é moderada, sobretudo considerando a quantidade dos estudos existentes e a heterogeneidade metodológica entre eles.

Keywords: Age Determination by Teeth. Forensic dentistry. Systematic Review.

ABSTRACT

Objective: It was evaluated the applicability of the Table of Permanent Teeth Mineralization among Brazilians for age estimation with forensic purposes. **Method:** The PRISMA guidelines (*Preferred Report of Systematic Reviews and Meta-Analysis*) were used for study design, and bibliographical searches were performed in the databases: Web of Science, Pubmed, Scopus, Cochrane, LILACS and SIGLE, according to PICO/PECO strategy. **Results:** A total of 10,280 records were retrieved from the databases, of which 20 articles were selected for full-text analysis after preliminary screening. Five articles plus one additional article selected by manual search were included in the final review, totaling six articles. The selected studies presented a cross-sectional design, five of which were developed in Brazil and two abroad. The assessment of methodological quality, performed with the use of QUADAS adapted by Lopes (2012), indicated that all six studies met more than 50% of the quality requirements and one of them met all the requirements. To compare the estimated and actual chronological age, four studies utilized correlation analysis while two employed descriptive statistics. The findings revealed discrepancy between the estimated age and the actual chronological age, which led the majority of authors to advocate a moderate use of the method as well as to indicate the use of correction factors for specific populations and its association with other age estimation methods. **Conclusion:** the existing evidence on the applicability of the Nicodemo, Moraes and Médici Filho's method (1974) for age estimation with forensic purposes is moderate, given the scarcity of studies and methodological heterogeneity between them.

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INTRODUCTION

Ascertaining an individual's age is critical to define their legal duties. Thus, according to the Brazilian Civil Code, individuals under the age of sixteen are considered legally disabled persons; individuals aged between sixteen and eighteen years are considered relatively disabled, while those over the age of eighteen are held liable for their actions and thus considered legally capable. Criminally, the individual's ages are considered important in cases of sexual violence, criminal liability and reduction of the criminal conviction.[1,2]

An individual's age can be estimated directly, through clinical examination of the dental arches, or indirectly, with the aid of radiographic images. Direct examination is specifically based on the phenomenon of tooth eruption, which can be influenced by several factors, among them: sex, given that girls have an early tooth eruption process due to their differential pre-puberty and puberty development between 8 and 15 years of age; dental arch, considering that lower teeth erupt sooner than upper ones; and food intake, as severe malnutrition causes a delay in tooth eruption. Pathological conditions, including hypo and hyperthyroidism, anodontia and early loss of deciduous teeth, may likewise affect tooth eruption.[1,3,4,5,6] As for indirect dental examination, the most commonly used approach is the dental mineralization staging, as it is less affected by local factors such as dental cavities caused by caries, premature loss of primary teeth or crowding.[7]

The estimation of dental age of living and dead individuals has aroused interest of researchers worldwide. This is because different populations have been shown to have distinct growth patterns from one another, which generates specific problems in terms of ethical and legal issues.[8]

In Brazil, Nicodemo[9] Moraes[10] and Médici Filho[11] investigated the chronology of tooth mineralization by means of the radiographic method. In particular, Nicodemo[9] studied the development of third molars, while Moraes[10] examined permanent incisives and first molars. Lastly, Médici Filho[11] investigated the development of permanent canines, premolars and second molars. Based on that, the Table of the Chronology of Permanent Teeth Mineralization was created for the Brazilian population, which requires the use of panoramic radiographs to determine at which of eight mineralization stages each specific tooth is, so that to estimate an individual's age.[12]

As it is a method proposed in Brazil and widely used in several localities, its applicability to different nationalities depends heavily on factors like ethnicity and environment, which may ultimately influence the methodology proposed and the study outcomes. In order to make the method universal and more practical to the daily routine of reference centers in each country, including Brazil, it is critical to further evaluate its applicability as reported in our study.

In this systematic review, we evaluated the applicability of the Nicodemo, Moraes & Médici Filho's age estimation method[12] among children, adolescents and young adults, with the aim of gathering the existing evidence on the method and subsequently of subsidizing its implementation, or not, into the routine of forensic experts in Brazil and worldwide.

MATERIAL AND METHODS

This review was registered in the Open Science Framework (https://osf.io) database (DOI 10.17605/OSF.IO/V4Q96). The methodology was developed in accordance with the protocol for reporting systematic reviews proposed by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)[13], as follows: search strategy, screening of studies based on inclusion and exclusion criteria, selection of articles, methodological quality assessment and risk of biases assessment of selected articles, data extraction, and tabulation.

Search strategy

Papers published up to May 2017, with no restriction related to date or language of publication, were selected based on the PICO/PECO strategy, where P refers to the study population, I/E to the intervention/exposure, C to the control, and O to the outcome(s). Bibliographical searches were carried out in the following databases: Pubmed, Scopus, Cochrane Library, Web of Science, LILACS and System for Information on Gray Literature (SIGLE). The topics were combined by the Boolean operator "AND" and each topic was created by using the "OR" operator; for that, the topics were extracted from the title, summary and keywords used in the indexing database (MeSH terms). The first topic referred to the different ways of mentioning the population's interest in the central question of this systematic review, and included the following keywords: "children", "adolescent", "young adult". The second topic consisted of I / E, that is, the method used for age estimation, in which the following keywords were included: "forensic sciences", "forensic dentistry", "age determination by teeth" and "radiographic, panoramic". The searches in the different databases are listed in Table 1. We also searched the references of selected articles to identify studies that were not retrieved in the initial search. References from selected articles were also checked to search for additional studies that were not retrieved in the initial screening.

***Table 1**: Eletronic database used and search strategy*

Pubmed	Web of Science	Scopus	Cochrane	Lilacs	Siegle
((((((((((((((((((((((((((((((Child[MeSH Terms]) OR Child[Title/Abstract]) OR Children[Title/Abstract]) OR Minors[MeSH Terms]) OR Minors[Title/Abstract]) OR Minor[Title/Abstract]) OR Adolescent[MeSH Terms]) OR Adolescent[Title/Abstract]) OR Adolescents[Title/Abstract]) OR Adolescence[Title/Abstract]) OR Teens[Title/Abstract]) OR Teen[Title/Abstract]) OR Teenagers[Title/Abstract]) OR Teenager[Title/Abstract]) OR Youth[Title/Abstract]) OR Youths[Title/Abstract]) OR Young adult[MeSH Terms]) OR Young adult[Title/Abstract]) OR Adults, Young[Title/Abstract]) OR Adult[MeSH Terms]) OR Adult[Title/Abstract]) OR Adults[Title/Abstract])) AND ((((((((((((((((((((((((((((Forensic Dentistry[MeSH Terms]) OR Forensic Dentistry[Title/Abstract]) OR Dentistry, Forensic[Title/Abstract]) OR Forensic Odontology[Title/Abstract]) OR Age determination by teeth[MeSH Terms]) OR Age determination by teeth[Title/Abstract]) OR Age determination[Title/Abstract]) OR Age estimation[Title/Abstract]) OR Odontogenesis[MeSH Terms]) OR Odontogenesis[Title/Abstract]) OR Tooth Calcification[MeSH Terms]) OR Tooth Calcification[Title/Abstract]) OR Calcification, Teeth[Title/Abstract]) OR Calcifications, Teeth[Title/Abstract]) OR Teeth Calcifications[Title/Abstract]) OR Calcification, Tooth[Title/Abstract]) OR Calcifications, Tooth[Title/Abstract]) OR Tooth Calcifications[Title/Abstract])))))))) AND ((((Age determination by teeth[MeSH Terms]) OR Age determination by teeth[Title/Abstract]) OR Age determination[Title/Abstract]) OR Ag estimation[Title/Abstract]))	TS=(Child* OR Minor* OR Adolescen* OR Teen* OR Youth* OR "Young Adult*" OR Adult OR Adults) AND TS=("Forensic Dentistry" OR "Forensic Odontology" OR "Age determination by teeth" OR "Age determination" OR "Age estimation" OR Odontogenesis OR "Tooth Calcification" OR "Teeth Calcification" OR "Tooth Calcifications" OR "Teeth Calcifications") AND TS=("Age determination by teeth" OR "Age determination" OR "Age estimation")	(TITLE-ABS-KEY (child) OR TITLE-ABS-KEY (children) OR TITLE-ABS-KEY (minors) OR TITLE-ABS-KEY (minor) OR TITLE-ABS-KEY (adolescent) OR TITLE-ABS-KEY (adolescents) OR TITLE-ABS-KEY (adolescence) OR TITLE-ABS-KEY (teens) OR TITLE-ABS-KEY (teen) OR TITLE-ABS-KEY (teenagers) OR TITLE-ABS-KEY (teenager) OR TITLE-ABS-KEY (youth) OR TITLE-ABS-KEY (youths) OR TITLE-ABS-KEY ("Young Adult") OR TITLE-ABS-KEY (adult) OR TITLE-ABS-KEY (adults)) AND (TITLE-ABS-KEY ("Forensic Dentistry") OR TITLE-ABS-KEY ("Forensic Odontology") OR TITLE-ABS-KEY ("Age determination by teeth") OR TITLE-ABS-KEY ("Age determination") OR TITLE-ABS-KEY ("Age estimation") OR TITLE-ABS-KEY (odontogenesis) OR TITLE-ABS-KEY ("Tooth Calcification") OR TITLE-ABS-KEY ("Teeth Calcification") OR TITLE-ABS-KEY ("Tooth Calcifications") OR TITLE-ABS-KEY ("Teeth Calcifications")) AND (TITLE-ABS-KEY ("Age determination by teeth") OR TITLE-ABS-KEY ("Age determination") OR TITLE-ABS-KEY ("Age estimation")))	#1 MeSH descriptor: [Child] explode all trees #2 Child* #3 #1 or #2 #4 MeSH descriptor: [Minors] explode all trees #5 Minor #6 #4 or #5 #7 #3 or #6 #8 MeSH descriptor: [Adolescent] explode all trees #9 Adolesc* or Teen* or Youth* #10 #8 or #9 #11 MeSH descriptor: [Young Adult] explode all trees #12 "Young Adults" #13 #11 or #12 #14 MeSH descriptor: [Adult] explode all trees #15 #7 or #10 #16 #13 or #14 #17 #15 or #16 #18 MeSH descriptor: [Forensic Dentistry] explode all trees #19 "Forens* Dentistry" or "Forens* Odontology" #20 #18 or #19 #21 MeSH descriptor: [Age Determination by Teeth] explode all trees #22 "Age determination by teeth" or "Age estimat*" #23 #21 or #22 #24 MeSH descriptor: [Odontogenesis] explode all trees #25 MeSH descriptor: [Tooth Calcification] explode all trees #26 "Teeth Calcification*" #27 #25 or #26 #28 #20 or #23 #29 #24 or #27 #30 #28 or #29 #31 #17 and #30 and #23 #32 #17 and #30	(mh:(Child)) OR (tw:(Child)) OR (tw:(Niño)) OR (tw:(Criança)) OR (tw:(Children)) OR (mh:(Minors)) OR (tw:(Minors)) OR (tw:(Menores)) OR (tw:("Menores de Idade")) OR (tw:(Minor)) OR (mh:(Adolescent)) OR (tw:(Adolescent)) OR (tw:(Adolescente)) OR (tw:(Adolescents)) OR (tw:(Teen)) OR (tw:(Teens)) OR (tw:(Teenagers)) OR (tw:(Teenager)) OR (tw:(Youth)) OR (tw:(Youths)) OR (mh:("Young Adult")) OR (tw:("Young Adult")) OR (tw:("Adulto Joven")) OR (tw:("Adulto Jovem")) OR (mh:(Adult)) OR (tw:(Adult)) OR (tw:(Adults)) OR (tw:(Adulto)) AND (mh:("Forensic Dentistry")) OR (tw:("Forensic Dentistry")) OR (tw:("Odontología Forense")) OR (tw:("Odontologia Legal")) OR (tw:("Dentistry, Forensic")) OR (tw:("Forensic Odontology")) OR (mh:("Age determination by teeth")) OR (tw:("Age determination by teeth")) OR (tw:("Determinación de la Edad por los Dientes")) OR (tw:("Determinação da Idade pelos Dentes")) OR (tw:("Age determination")) OR (tw:("Age estimation")) OR (mh:(Odontogenesis)) OR (tw:(Odontogenesis)) OR (tw:(Odontogénesis)) OR (tw:(Odontogênese)) OR (mh:("Tooth Calcification")) OR (tw:("Tooth Calcification")) OR (tw:("Calcification, Teeth")) OR (tw:("Calcifications, Teeth")) OR (tw:("Calcification, Tooth")) OR (tw:("Calcifications, Tooth")) OR (tw:("Tooth Calcifications")) OR (tw:("Teeth Calcification")) OR (tw:("Teeth Calcifications")) OR (tw:("Calcificación de Dientes")) OR (tw:("Calcificação de Dente")) AND (mh:("Age determination by teeth")) OR (tw:("Age determination by teeth")) OR (tw:("Determinación de la Edad por los Dientes")) OR (tw:("Determinação da Idade pelos Dentes")) OR (tw:("Age determination")) OR (tw:("Age estimation"))	(child OR children OR minors OR minor OR adolescent OR adolescents OR adolescence OR teen OR teens OR teenagers OR teenager OR youth OR youths OR "young adult" OR adult OR adults) AND ("forensic dentistry" OR "forensic odontology" OR "age determination by teeth" OR "age determination" OR "age estimation" OR "odontogenesis" OR "tooth calcification" OR "teeth calcification" OR "tooth calcifications" OR "teeth calcifications") AND ("age determination by teeth" OR "age determination" OR "age estimation")

Eligibility criteria

We included cross-sectional studies with children, adolescents and young adults utilizing panoramic radiographs to estimate their chronological age by the Nicodemo, Moraes and Médici Filho's method.[12] Editorials, literature reviews, case reports, case series and analytical studies that did not compare the effectiveness of the age estimation method, were excluded from analysis. Studies that showed repeated results from the same original publication and those in which the study subjects were from specific populations with a common disease, were also excluded. After initial screening, the selected articles were read in full to confirm their eligibility.

Two examiners, who were responsible for the searches, performed independently the initial selection of articles from the analysis of titles and abstracts. Subsequently, the pre-selected articles were checked in full for their eligibility. In cases of disagreement, consensus was obtained from the discussion with a third examiner.

After full reading of selected articles, thirteen studies addressed the applicability of other methods for age estimation than the method of interest of our study, and one

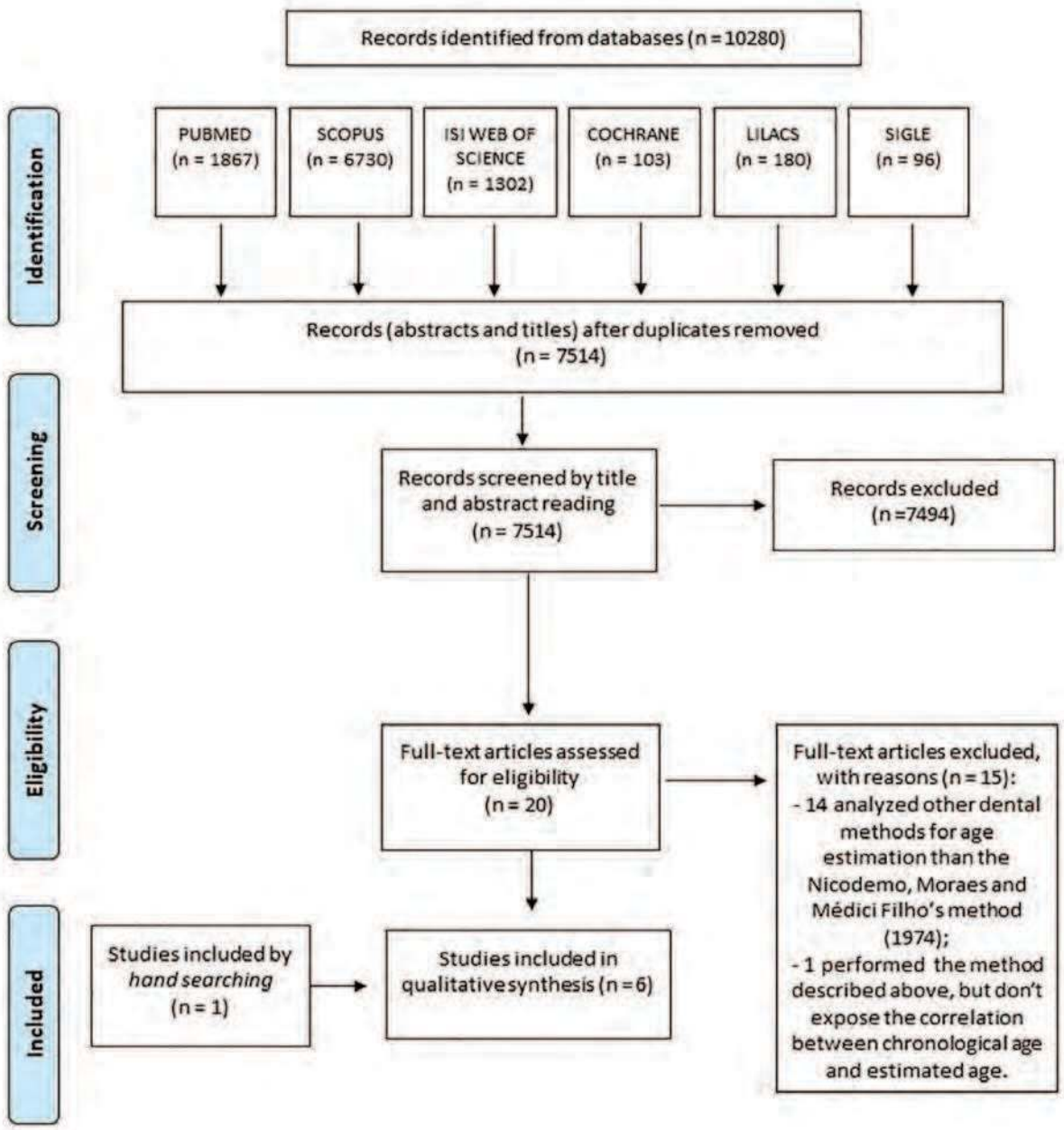


***Figure 1**: PRISMA flow diagram of the search results from the databases.*

used the Table of of Nicodemo, Moraes and Medici Filho for a specific evaluation of third molars. In addition, the latter did not present results regarding the comparison between the estimated and chronological ages. With that, a total of six studies were submitted to methodological quality assessment.

For greater organization in the selection of articles and management of references, the Zotero software version 5.052 was used.

Quality assessment

The evaluation of the methodological quality and risk of bias of the selected studies was carried out independently by the two examiners using QUADAS 2 (Quality Assessment of Diagnostic Accuracy Studies)[14], which is recommended for studies on the accuracy of diagnostic tests. However, as an age estimation method does not constitute a typical diagnostic test, some adaptations were proposed by Lopes (2012)[15] to fit some questions to the technique.

Data extraction

A standardized form for data extraction was used, which included, among other information, country or location of study, sample size, chronological age of the study subjects, age estimated by the Nicodemo, Moraes and Medici Filho's method[12] and the approach utilized for data analysis. All steps of this systematic review were carried out independently by two examiners and all possible disagreements were solved through the evaluation of a third examiner.

RESULTS

A total of 10,280 records were retrieved from the databases, of which 7,516 underwent initial screening (title and abstract) after exclusion of duplicate records. Of these, 7,496 records were excluded from analysis, as they were descriptive studies, editorials, narrative reviews and case reports. The remaining 20 articles were selected for full-text analysis and screened for the eligibility criteria. Of these, 14 articles were excluded due to the following reasons: Thirteen studies investigated the applicability of age estimation methods other than the one of interest; one utilized the Nicodemo, Moraes and Médici Filho's[12] table to specifically assess third molars and did not compare the estimated and the actual chronological ages. During the full-text analysis, one article was included from a manual search through the references of the selected articles. Hence, a total of six articles were included in the systematic review (Fig. 1).

The assessment of methodological quality indicated that all six studies met more than 50% of the quality requirements, as seen in Table II. Only one article (MORENO et al.)[16] met all the requirements listed on the assessment chart. The studies by Rai[17], Oliveira et al.[18] and Miranda et al.[19] only received one "uncertain" score regarding the blinding of examiners to chronological age when the age estimation method was applied. The two remaining articles (KURITA et al.; CARNEIRO et al.)[20,21] did not clearly describe examiner blinding nor the criteria used for sample selection and, therefore, were scored "uncertain" in this regard.

The characteristics of the selected studies are described in Table III. All studies had a cross-sectional design and only two of which were carried out abroad (RAI; MIRANDA et al.).[17,19] The sample size ranged from 43 to 413 individuals, with a minimum age of 70 to 120 months and a maximum of 180 to 300 months. Another variable that differed substantially across studies was the teeth selected for analysis according to the Table of Permanent Teeth Mineralization among Brazilians.[12] Rai[17], Oliveira et al.[18] and Miranda et al.[19] did not mention the teeth analyzed in their studies; another article reported that lower left teeth were analyzed (KURITA et al.)[20]; Carneiro et al.[21] utilized third molars while Moreno et al.[16] proposed two methodologies, one considering 16 teeth and the other analyzing 4 teeth (second and third molars).

Inferential statistical analysis was performed in four of the primary studies, and the authors compared the results between the estimated and the actual chronological age by using correlation tests.

***Table 2**: Assessment of the methodological quality of the studies selected in the systematic review.*

Quality assessment criteria	Sample with similar demographic and clinical characteristics	Clear selection criteria	Verification of the results obtained	Detailed description of the diagnostic test run	Examiner(s) blinding to the standard reference	Description of the reasons for exclusion of articles
KURITA et al.[19]	Yes	Uncertain	Yes	Yes	Uncertain	Yes
RAI.[16]	Yes	Yes	Yes	Yes	Uncertain	Yes
CARNEIRO et al.[20]	Yes	Uncertain	Yes	Yes	Uncertain	Yes
OLIVEIRA et al.[17].	Yes	Yes	Yes	Yes	Uncertain	Yes
MORENO et al.[15]	Yes	Yes	Yes	Yes	Yes	Yes
MIRANDA et al.[18]	Yes	Yes	Yes	Yes	Uncertain	Yes

***Table 3**: Characteristics of the studies included in the systematic review.*

Author(Year)	Study location	Type of study	Age range	Sample (Males/Females)	Teeth examined	Number of examiners	Statistical analysis	Main outcomes	Conclusions
KURITA, L.M.; NETO, F.H. (2007)	Fortaleza, CE, Brazil	Cross-sectional	84-180 months	360 (120/120)	Lower left teeth	1	Descriptive statistics (mean, SD, 95% CI) for each age group, Student-Neuman-Keuls test, Pearson's correlation, and linear regression (á=5%).	The estimated age for males was 125.87 (± 29.51) months, with a percentage of variation of 8.0% in relation to the chronological age (135.9 ± 30.4). The estimated age for females was 130.71 (± 29.95) months, with a percentage of variation of 4.0% in relation to the chronological age (135.97 ± 30.83). There was no statistically significant difference for both sexes (p-value ⊠0.05). A significant correlation was observed between the estimated and actual ages (0.899 for males and 0.894 for females). A coefficient of determination of 0.8092 was obtained.	Despite the usefulness of the method for age estimation, the use of correction factors (regression equations) is recommended to improve the applicability of the method to the study population.
RAI, B. (2008)	New Delhi, India	Cross-sectional	70-195 months	413 (207/206)	Not stated	1	Descriptive statistics (mean, SD, 95% CI) for each age group, Student's T-test and Pearson's Correlation.	The estimated age for males was 138.4 (± 22.41) months, with a percentage of variation of 3.5% in relation to the chronological age (143.2 ± 1.89). The estimated age for females was 132.49 (± 1.89) months, with a percentage of variation of 3.29% in relation to the chronological age (141.8 ± 3.29). There was no statistically significant difference between the estimated and actual ages for both sexes (p-value >0.05). Significant correlation coefficients between the estimated and actual ages were obtained (0.821 for males and 0.923 for females).	While there was a correlation between the estimated and actual ages, correction factors must be utilized to make the method applicable to the Indian population.

***Table 3**: Characteristics of the studies included in the systematic review.*

Author(Year)	Study location	Type of study	Age range	Sample (Males/ Females)	Teeth examined	Number of examiners	Statistical analysis	Main outcomes	Conclusions
CARNEIRO et al. (2010	Maceió, AL, Brazil	Cross-sectional	108-252 months	312 (118/194)	Third molars	3	Descriptive statistics (mean, SD, 95% CI) for each stage of mineralization; Linear regression graphs and Spearman's correlation were used to evaluate the correlation between the estimated age and the actual chronological age; Student's t-test for difference between sexes.	No statistically significant difference was observed between the sexes, except for stage 7 of upper third molars, which indicated a higher mean age among males. The correlation coefficients were 0.853 (upper teeth), 0.867 (lower teeth) and 0.869 (upper and lower teeth), suggesting that the combination of different teeth in the analysis led to a slight increase in the correlation between the estimated and actual ages.	Despite the identification of significant correlations (p-value < 0.01), there were notable differences between the estimated and actual chronological ages. The practical relevance of these differences reinforces the responsibility of forensic dentists during age estimation examination, as the result of which will affect the future of the examinee regarding criminal sanctions.
OLIVEIRA et al. (2010)	Cuiabá, MT, Brazil	Cross-sectional	96-215 months	200 (100/100)	Not stated	1	Descriptive statistics for the percentage of error between males and females and among the total number of analyzed	A total of 54% of age matches (N=108) and 46% of mismatches (N = 92) were observed, with 55% matches and 45% mismatches for males, and 53% and 47% for females, respectively. Of the 92 reported mismatches, 43 were related to age overestimation while 49 cases were related to age underestimation. The age matches were more frequent than the mismatches in individuals under 14 years of age. Above this age group, a	The method showed a 54% accuracy when applied in individuals from Cuiabá-MT. The number of mismatches is very significant after the age of 14, so the authors suggest a formula through statistical analysis to ensure greater accuracy of the method in this specific

***Table 3**: Characteristics of the studies included in the systematic review.*

Author(Year)	Study location	Type of study	Age range	Sample (Males/ Females)	Teeth examined	Number of examiners	Statistical analysis	Main outcomes	Conclusions
MORENO et al. (2014)	João Pessoa, PB, Brazil	Cross-sectional	120-300 months	94 (46/48)	1st assessment: 16 teeth (8 upper and 8 lower)2nd assessment: 4 teeth (upper and lower second and third molars)	1	Descriptive statistics (mean, SD, 95% CI) for each tooth; Pearson's Chi-Square test (á=5%).	The percentage of correctness of age estimation in relation to the chronological age was higher when only 4 teeth (81.9%) were evaluated, as compared to the 16 teeth (4.3%) approach. The highest percentage of correctness was obtained for third molars, both upper (63.8%) and lower (68.1%). No significant difference was observed between the sexes (p-value > 0.05). As for age, the percentage of correctness was significantly higher among individuals aged between 10 and 15 years (94.4%) than among those older than 15 years (65.0%) (p-value 0.001).	The use of the 16-teeth approach was shown to have a low percentage of correctness, while the 4-teeth approach showed more satisfactory results, in particular for individuals aged between 10 and 15 years. Nevertheless, the results regarding age estimation showed a very wide age range, which makes it unfeasible to apply this method solely in the study sample. method solely in the study sample.
MIRANDA et al. (2015)	Coimbra, Portugal	Cross-sectional	72-132 months	43 (24/19)	Not stated	4	Descriptive statistics (simple and relative frequency, mean and SD) for the age ranges	There was a prevalence of 55.85% of males against 44.2% of females in the study sample. Among the age groups analyzed is 72-132 months group, with a mean of 104.11 months (± 18.8). The age was properly estimated as compared to the chronological age in 75% and 68.4% of the male and female population, respectively. Overall, the method had a 71% percentage of correctness (94.5% for 96-108 months, 50% for 120-132 months, and 63.7% for 72-84	There was a relationship between the chronological age and the development stage in the majority of the sample. The assessment of this method in the study population did not suffice, as different behaviors and patterns were found according to the peculiarities of the samples in each region.

DISCUSSION

In this systematic review, we followed the criteria proposed by Lopes[15] for the assessment of methodological quality, which considers the inclusion of studies that meet, at least, more than 50% of the quality requirements. Four out of the six selected articles were performed with a Brazilian population and only two of them included populations from other countries, India and Portugal. These characteristics were expected, as studies addressing the applicability of diagnostic tests commonly present a cross-sectional design. Particularly, it is understandable that most of them were carried out in Brazil, since the method was based on a Brazilian population from São Paulo State and the authors suggested that other regions of the country should also be examined.[12]

In the majority of studies, the applicability of the age estimation method was performed by a single calibrated examiner. Three examiners were included in the study by Carneiro et al.[21] as compared to four in the study by Miranda et al.,[19] whom were tested for their inter-examiner agreement.

Pearson's correlation test was used in the studies by Rai[17] and Kurita et al.[20] to compare the estimated and actual chronological age, while Spearman's correlation was utilized by Carneiro et al.[21] Moreno et al.[16] proposed the evaluation of the hit rate (percentage of correctness) as a means of comparing the estimated age with the actual chronological age. Chi-Square test was employed to verify the difference between the two proposed methodologies, that is, the 16-teeth and 4-teeth assessment model. Such inconsistencies among the selected studies led us not to make a quantitative synthesis as one of the requisites for meta-analysis is the assessment of heterogeneity of primary studies.[22]

The findings of the selected studies revealed a discrepancy between the estimated age and the actual chronological age, which led the majority of authors to advocate a moderate use of the method as well as to indicate the use of correction factors for specific populations and its association with other age estimation methods.

The study by Kurita et al.[20] underestimated the dental age in relation to the chronological age by 8% in males and 4% in females, with no statistically significant difference in both sexes. Rai[17] underestimated the dental age by 3.5% in males and 3.29% in females, with no significant difference. Contrarily, the correlation coefficient obtained by the authors was found to be significant, indicating a discrepancy between the estimated and the actual chronological age, which is in line with the conclusion of this systematic review. The authors recommend that one should combine the Nicodemo, Moraes and Médici Filho's method[12] with other methods to justify its practical applicability or even adjust for correction factors in order to make it valid.

In the study by Carneiro et al.,[21] there was overestimation of age in males when upper third molars at mineralization stage 7 were used as a reference based on the Nicodemo, Moraes and Médici Filho's method.[12] These findings agree with those reported by Cornélio Neto[23], who also observed overestimation of age in males, based on the rationale that third molars undergo mineralization earlier in males than in females, around 104-254 months. Contrarily, Nicodemo, Moraes and Médici Filho[12] reported similar age ranges for both sexes based on the mineralization of upper and lower third molars. A significant correlation was found in the study by Carneiro et al.[21], which demonstrates great variation between the estimated and the actual chronological ages. Consistent with that, Kurita et al.[20] also found a strong correlation with significant differences in the estimated and actual age among males. The practical relevance of these differences reinforces the responsibility of forensic dentists during age estimation examination, as the result of which will affect the future of the examinee regarding criminal sanctions.

Moreno et al.[16] observed that when a few teeth (N = 4) are evaluated in the comparison between the estimated and the actual chronological age, the percentage of correctness increases. On the other hand, it is considerably decreased when several teeth are evaluated (N = 16). The authors also proved that in individuals aged between 10 and 15 years, the percentage of correctness was significantly greater (94.4%) than that in individuals older than 15 years (65.05%).

Miranda et al.[19] evaluated the applicability of the Nicodemo, Moraes and Medici Filho's method[12] in a Portuguese population aged 72 to 132 months (N = 43) using panoramic radiographs. Four examiners were chosen to evaluate the radiographs, with a percentage of correctness of 75% for males and 68.4% for females. In terms of specific age ranges, the percentage of correctness (94.5%) found by Miranda et al.[19] was higher for the 96-108 months group, which is consistent with the study by Moreno et al.,[16] who found a 94.4% percentage of correctness for the age group 10-15 years. When analyzing the 120-132 months group, the latter found an equivalent percentage of correctness (50%) and mismatches (50%). Furthermore, there was overestimation of age in the 72-84 months group (8.6%) and underestimation in the 120-132 months group (11.4%). The authors suggest the combination with other methods given that, despite the ease of application, the Nicodemo, Moraes and Medici Filho's method[12] did not suffice to estimate the chronological age of the study population. Wang et al.[24] investigated the accuracy of the Willems' method for age

estimation through a systematic review. They pointed out that due to the large ethnic and regional difference within a country, it is imperative to increase the sample representativeness and size nationwide, thereby improving the assessment of the applicability of age estimation methods.

The applicability of the Nicodemo, Moraes and Médici Filho's method[12] was also investigated by Oliveira et al.[18] using 200 panoramic radiographs (100 from males and 100 from females) in a sample from Cuiabá, MT, Brazil, aged 8-18 years. Overall, the percentage of correctness was found to be 54% (N = 108), being 55% among males and 53% among females. The percentage of correctness was higher in individuals up to 14 years of age, which corroborates with the studies by Moreno et al.[15] and Miranda et al.[18] In addition, the subjects' age was overestimated in 49 (53.26%) of the mismatch cases and underestimated in 43 (46.74%) of them. These findings disagree with those reported by Miranda et al.,[19] as these authors found that the age was overestimated in 25.58% of the cases and underestimated in 74.42% of them. The low percentage of correctness (54%) reported by Oliveira et al.[18] suggests that the method is not applicable to the population of Cuiabá and, therefore, it needs to be adapted for greater accuracy.

Nóbrega et al.[25] carried out a study at the Federal University of Paraíba to determine the easiness and difficulties experienced by 52 undergraduate dental students when using the Nicodemo, Moraes and Médici Filho's method[12]. This age estimation training was part of the activities developed in the Forensic Dentistry course, with the purpose of exploring the functionality and/or importance of this practice for the students' academic training. The authors concluded that such practical activity contributed to the professional training of the students, as the applicability of the method was the most frequently mentioned positive aspect of the course (19%), while the subjectivity of the method (25%) was defined as the greatest difficulty experienced by the students.

The existence of cross-sectional studies evaluating the applicability of the Nicodemo, Moraes and Médici Filho's method[12] is scarce and did not allow for a for a possible meta-analysis. This demonstrates the need for further cross-sectional studies using this method in different populations, including populations from different regions of Brazil, so that the inter-study comparison and evaluation is made possible.

Taken altogether, the Nicodemo, Moraes and Médici Filho's method[11] was shown to present several shortcomings which prevent it from being utilized alone, particularly due to the high variability observed depending on the geographical location of the sample as well as due to execution flaws.

CONCLUSION

We conclude that the existing evidence on the applicability of the Nicodemo, Moraes and Médici Filho's method (1974) for age estimation with forensic purposes is moderate, given the scarcity of studies and methodological heterogeneity between them.

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ORAL HEALTH OF INDIVIDUALS WITH MENTAL HEALTH DISORDERS

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Palavras-chave: Depressão. Cárie Dentária. Saúde Mental. Doença Periodontal. Fumar.

RESUMO

Objetivo: Analisar o estado de saúde oral e dentária de uma população de pacientes com história de problemas de saúde mental. Conhecimento Prévio: Indivíduos com problemas de saúde mental só mais suscetíveis a doença oral relacionada a hygiene oral deficient, mudanças de comportamento, efeitos de medicações, e doenças sistêmicas. Saúde mental e oral afetam reciprocamente uma à outra. Problemas de saúde mental foram associados com falta de cuidado pessoal, boca seca, chance aumentada de uso de substâncias ilícitas, e risco aumentado de infecção oral. De forma semelhante, problemas de saúde oral afetam negativamente saúde mental. Halitose, cárie, perda de dentes, e problemas de fala podem agravar o estado de saúde mental relacionado com auto-estima e ansiedade. **Métodos**: The Dental Registry and DNA Repository (DRDR) da Faculdade de Medicina Dental da Universidade de Pittsburgh foi analisado na avaliação de pacientes com história de doença mental. Um total de 6.015 fichas de pacientes estava disponível no DRDR no momento dessa análise. Dessas, 1.068 eram fichas de pacientes com um problema mental. Prevalência de cárie, periodontite, atrição, edentulismo parcial e total, xerostomia, erosão, gengivite, disordem da articulação temporomandibular (TMD), e úlceras foram determinadas e comparadas com o resto do registro (N=4.947). Sexo e etnia foram também analisados. O teste to qui-quadrado com significância de 5% foi usado. **Resultados**: Dos 6.015 pacientes, 1.068 relataram história de problema de saúde mental. 59.2% reportou ter depressão, 16.7% ansiedade, 13.3% doença bipolar, 3.6% esquizofrenia, 2.3% transtorno de estresse pós-traumático (PTSD), e 2.3% problemas de alimentação. Doença mental estava significativamente associada com edentulismo parcial e total, cárie, atrição, xerostomia, erosão, TMD, ulceração, e gengivite. Doença mental também for significativamente associada com o sexo feminino e etinia branca. **Conclusões**: Problemas mentais signifcativamente afetam a saúde oral. Pessoas com problemas de saúde mental parecem ter risco aumentado à cárie, atrição, erosão, edentulismo, xerostomia, inflamcação das gengivas, e TMD. Esses resultados poderão ajudar a direcionar medidas de prevenção e tratamento dessas pessoas.

Keywords: Depression. Dental Caries. Mental Health. Periodontal Diseases. Smoking.

ABSTRACT

Objective: To analyze the oral and dental health conditions in a population of patients with a history of mental health disorders. Background: Individuals with mental health disorders are susceptible to dental disease related to poor oral hygiene, behavioral changes, medication effects, and systemic disease. Mental health and dental health reciprocally affect one another. Poor mental health has been associated with self-neglect, dry mouth, increased likelihood of substance abuse, and a higher susceptibility to oral infection. Similarly, poor dental health negatively affects mental health. Halitosis, dental caries, missing teeth, and affected speech can exacerbate mental health illness related to self-esteem and social anxiety. **Methods:** The Dental Registry and DNA repository (DRDR) at the University of Pittsburgh School of Dental Medicine was analyzed for patients with a history of mental health disorder. A total of 6,015 patient records were available from the DRDR at the time of this analysis. 1,068 patient records were available for individuals reporting a mental health disorder. We examined the prevalence of various dental conditions in a population of patients reporting a mental health disorder (N=1,068) in comparison to the rest of the registry (N=4,947), as well as the distribution of disorders and demographics. Mental health disorders included in this study are depression, anxiety, schizophrenia, bipolar disorder, post-traumatic stress disorder (PTSD), and eating disorders. Oral and dental health was assessed by dental caries, periodontal disease, gingivitis, tooth wear, complete and partial edentulism, xerostomia, coated tongue, gingivitis, oral ulceration, periapical lesions, and TMD. The prevalence of smoking, alcohol abuse, and substance abuse was also determined. Sex and ethnicity were also examined. **Results**: Of 6,015 patients, 1,068 reported a history of mental health disorder. 59.2% reported having depression, 16.7% reported anxiety, 13.3% reported bipolar disorder, 3.6% reported schizophrenia, 2.3% reported post-traumatic stress disorder (PTSD), and 2.3% reported an eating disorder. Mental illness was significantly associated with partial and complete edentulism, dental caries, tooth wear, xerostomia, erosion, TMD, ulceration, and gingivitis. Mental illness was also significantly associated with female sex and Whites. **Conclusions**: Mental health conditions can significantly affect the dental and oral health of affected individuals. Individuals with mental health conditions may be more susceptible to dental disease including dental caries, tooth wear, erosion, edentulism, dry mouth, gingival inflammation, and TMD. Understanding the association between mental and dental health can help direct prevention and treatment in a multidisciplinary setting.

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INTRODUCTION

Individuals with mental health disorders are increasingly susceptible to oral and dental disease related to oral hygiene, self-care, and systemic disease. The association between mental health and oral health is reciprocating, each with effects on the other. Poor mental health has been associated with dental caries, periodontal disease, dry mouth, behavioral changes, comorbid physical disease, smoking, alcohol and substance abuse, and susceptibility to oral infection. Additionally, poor oral health, including missing teeth, halitosis, and dental caries, can exacerbate the negative consequences of poor mental health.[1-6]

Kisely (2016) noted that individuals with common psychological disorders had greater rates of dental caries. Individuals with psychological disorders also had greater tooth loss than those without psychological disorders.[1-6] The association between periodontal status and psychiatric status has been debated. Although some studies suggest an association between periodontal status and psychiatric status,[7-9] others do not.[4-6] Increased rates of dental caries and tooth loss can be explained by drug-induced xerostomia associated with antipsychotics, antidepressants, and mood stabilizers.

The association between mental health and erosion is most clearly established in cases of self-induced vomiting, characterized by chemical erosion of the palatal surfaces of teeth.[4] Salivary dysfunction related to eating disorders can further potentiate dental caries. Furthermore, erosion can manifest in cases of high tobacco and alcohol use through gastroesophageal reflux.[6]

Piccoli et al. (2014) concluded that chronic neuroleptic drug use can lead to bruxism. It has been suggested that medications, disturbances in dopaminergic systems, and a psychological stress component are linked to bruxism in patients with psychological disorders. Tooth wear is more likely to be associated with bruxism than temporomandibular joint disorders (TMD). Nonetheless, symptoms of bruxism may include temporomandibular joint pain and myofascial pain.[10]

Smoking, alcohol, and substance abuse further exacerbate oral health issues of individuals directly through physiologic changes as well as indirect behavioral and motivational changes. Physiological effects include xerostomia, an urge for snacking, clenching and grinding, and erosion from application of substances, such as cocaine, directly onto the teeth. Indirect effects are related to lifestyle changes, such as a reduced interest in dental hygiene, access to care, poor nutrition, and infrequent and irregular dental visits.[11]

This study examines the prevalence of various dental conditions in a population of patients reporting a mental health disorder, as well as the distribution of disorders and some demographic variables. Mental health disorders included in this study are depression, anxiety, schizophrenia, bipolar disorder, post-traumatic stress disorder (PTSD), and eating disorders. Oral and dental health was assessed by dental caries, periodontal disease, gingivitis, tooth wear, complete and partial edentulism, xerostomia, coated tongue, gingivitis, oral ulceration, periapical lesions, and TMD. The prevalence of smoking, alcohol abuse, and substance abuse was also determined. Sex and ethnicity were also examined. Understanding the association between mental and dental health can help direct prevention and treatment in a multidisciplinary setting.

MATERIALS AND METHODS

The Dental Registry and DNA Repository (DRDR) at the University of Pittsburgh [University of Pittsburgh Institutional Review Board (IRB) approval # 0606091] was used. All patients reporting a history of mental health illness were included in the study. The database included a total of 6,015 patient records. 1,068 patients reported a history of mental health illness and were included in the study. The population included 428 males and 640 females, which included 844 Whites, 190 Blacks, eight Hispanics, five Indians, and 13 that reported “other.” The remaining 4,947 subjects in the registry were used as comparison.

Patients meeting inclusion criteria were analyzed for complete and partial edentulism, dental caries, periodontal disease, tooth wear, xerostomia, coated tongue, erosion, TMD, periapical lesions, oral ulceration, and gingivitis. The distribution of mental health conditions was determined. Prevalence values were compared between patients with and without mental health illness. Determination of prevalence was based on patients’ self-reported answers during the medical history survey recorded in the electronic health record. Sex, ethnicity, smoking, alcohol use, and other substance abuse were also analyzed and compared to the total DRDR population. Alcohol abuse was defined as having more than 15 drinks per week for males and more than 8

drinks per week for females. We defined substance abuse as the excessive use of psychoactive substances and illicit drugs. The chi-squared test was used to determine significance. P-values and 95% confidence intervals were determined for prevalence differences among patients reporting a history of mental health disorder and those that did not within the DRDR population.

RESULTS

The distribution of mental health disorders among the DRDR population was determined and shown in Figure 1. 59.2% reported having depression, 16.7% reported anxiety, 13.3% reported bipolar disorder, 3.6% reported schizophrenia, 2.3% reported PTSD, and 2.3% reported an eating disorder. Among 1,068 patients reporting a mental health disorder, 60% of patients reported as female and 40% reported male. Distribution of ethnicity among the population reporting a mental health disorder is shown in Figure 2. 80% reported as White, 18% as Black, and 2% as either Asian, Hispanic, or other. This frequency in Whites was higher than the expected frequency based on our DRDR data (65% Whites; $p<0.0000001$).

Prevalence values for complete edentulism, partial edentulism, dental caries, periodontitis, bruxism, attrition, xerostomia, coated tongue, erosion, TMD, periapical lesions, oral ulceration, and gingivitis were determined for patients reporting a history of mental health disorder. Prevalence differences in complete edentulism, partial edentulism, dental caries, attrition, xerostomia, coted tongue, erosion, TMD, oral ulceration, and gingivitis were statistically significant higher in individuals reporting mental disorders ($p<0.05$). Prevalence differences in periodontal disease, bruxism, and periapical lesions were not statistically significant ($p>0.05$) between the two comparison groups.

Figure 3 demonstrates the prevalence differences in dental and oral health conditions between patients with mental health disorder and patients without mental health disorder. 10.8% of patients with a history of mental health illness presented with complete edentulism compared to 5.6% of patients without mental health illness ($p<0.0001$; 95% confidence intervals 3.28, 7.31). 31.2% of patients with a history of mental health illness were partially edentulous compared to 26.2% of patients without a history of mental illness ($p=0.0009$; 95% confidence intervals 1.96, 8.12). Dental caries prevalence among patients with mental health disorder was 53.6% compared to 47.9% in patients without mental health disorder ($p=0.0007$; 95% confidence intervals 2.35, 9.03). 16.2% of patients with mental health disorder showed attrition compared to 9.8% in the remaining DRDR population ($p<0.0001$; 95% confidence intervals 4.07, 8.89). Of patients with mental health disorder, 24% reported xerostomia compared to 8.5% of patients without mental health disorder ($p<0.0001$; 95% confidence intervals 12.84, 18.28). 42.3% of patients with mental health disorder displayed a coated tongue upon oral examination compared to 37.4% of patients without mental health disorder ($p=0.003$; 95% confidence intervals 1.62, 8.21). Erosion was noted in 1.6% of patients with mental health illness compared to 0.7% of patients without mental health illness ($p=0.004$; 95% confidence intervals 0.18, 1.87). TMD was noted in 35.5% of patients with mental health illness compared to 30.2% of patients without mental health illness ($p=0.0007$; 95% confidence intervals 2.14, 8.52). 5.4% of patients with mental health illness presented with oral ulcers comparted to 3.4% of patients without mental health illness ($p=0.002$; 95% confidence intervals 0.61, 3.6). Gingivitis was noted in 28.2% of patients with mental health disorder comparted to 23% of patients without mental health illness ($p=0.0003$; 95% confidence intervals 2.26, 8.24).

Patients with a history of mental health disorder were also more likely to smoke, use alcohol excessively, and abuse substances. Figure 4 demonstrates prevalence differences in smoking, alcohol abuse, and substance abuse between patients with mental health disorder and patients without mental health disorder. Smoking was prevalent in 36.7% of patients with a history of mental health disorder compared to 23.3% in patients without mental health disorder ($p<0.0001$; 95% confidence intervals 10.26, 16.59). Prevalence differences in alcohol abuse, defined as greater than 15 drinks per week for males and greater than 8 drinks per week for females, was also statistically significant. 14.1% of patients with mental health disorder reported alcohol abuse compared to 10.1% of patients without a mental health disorder ($p=0.0001$; 95% confidence intervals 1.79, 6.37). Substance abuse was prevalent in 17.8% of patients with a mental health disorder compared to 11.6% of patients without a mental health disorder ($p<0.0001$; 95% confidence intervals 3.77, 8.78).

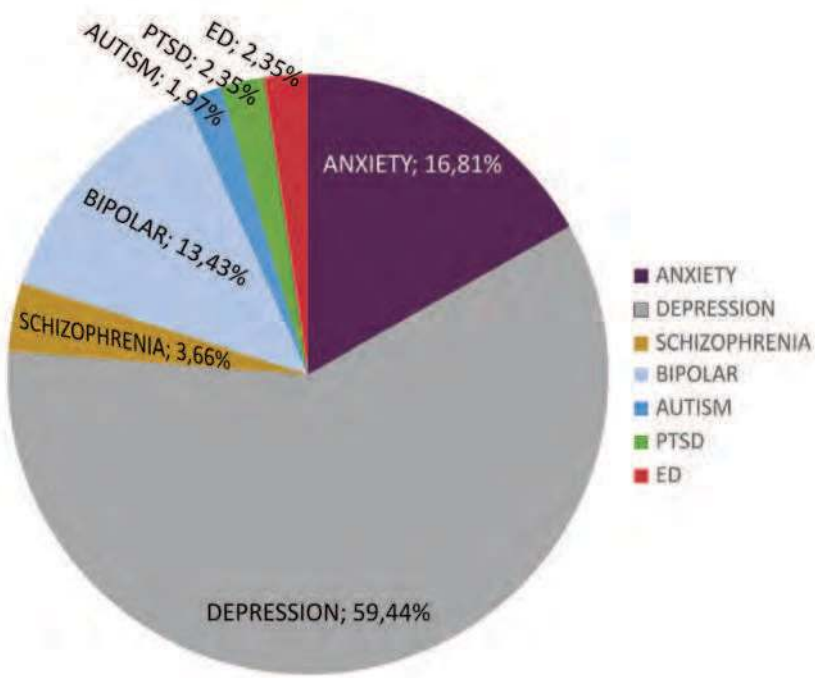


Figure 1: *Distribution of mental health conditions in patients reporting a mental health disorder (N=1,068) at the University of Pittsburgh School of Dental Medicine.*

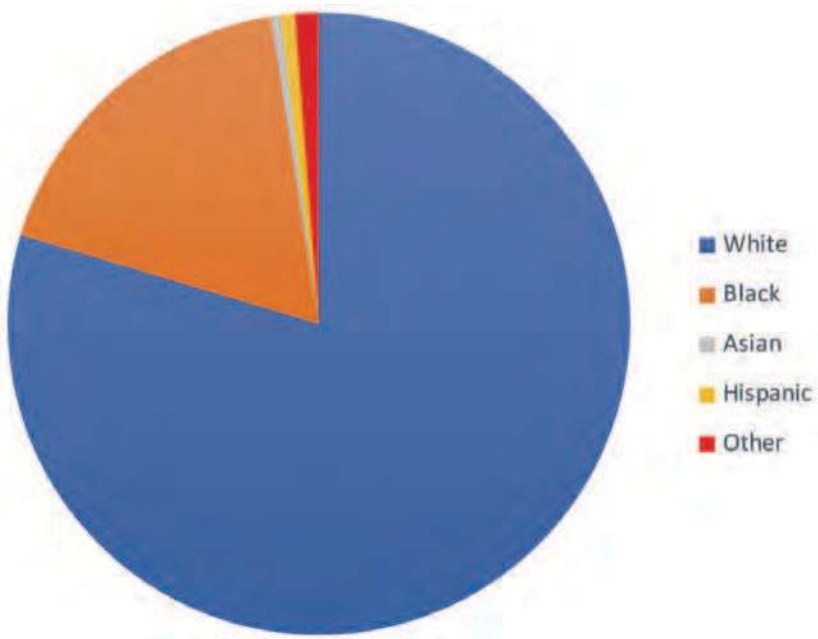


Figure 2. *Race Distribution of Patients reporting a mental health disorder at the University of Pittsburgh School of Dental Medicine.*

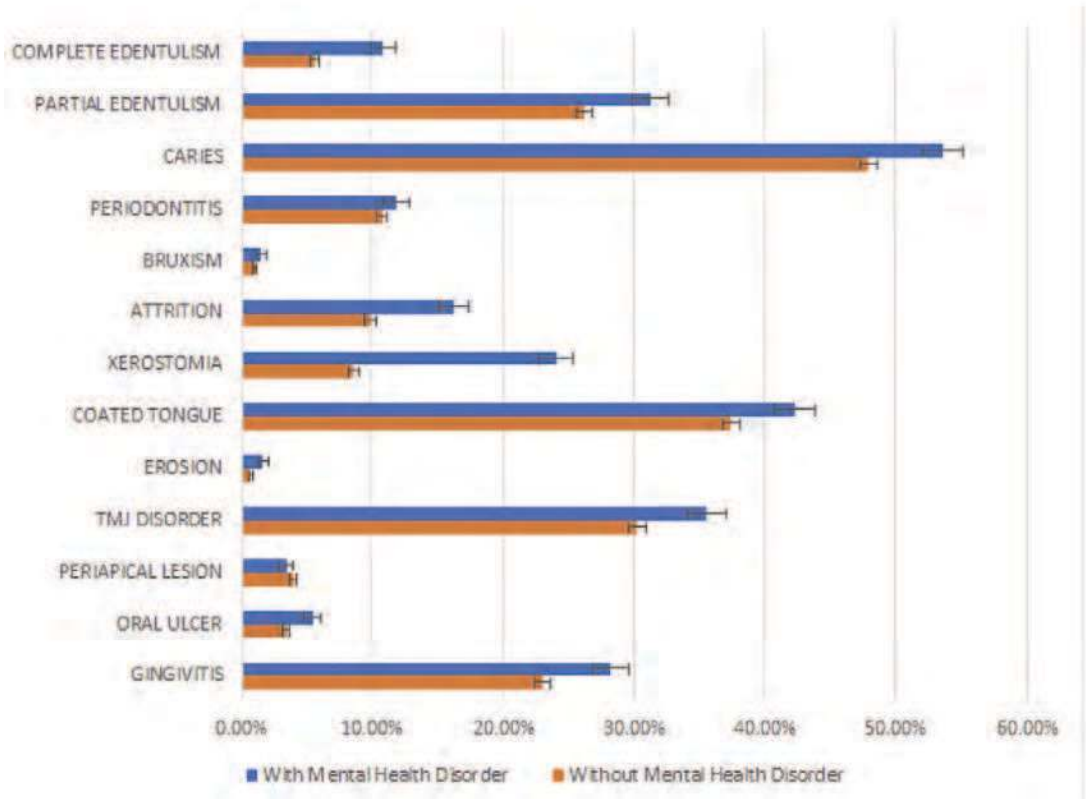


Figure 3: Prevalence differences of dental and oral conditions between patients with mental health disorder and patients without mental health disorder. Standard error bars are shown. p-value <0.05 for complete edentulism, partial edentulism, dental caries, attrition, xerostomia, coated tongue, erosion, TMD, oral ulceration,

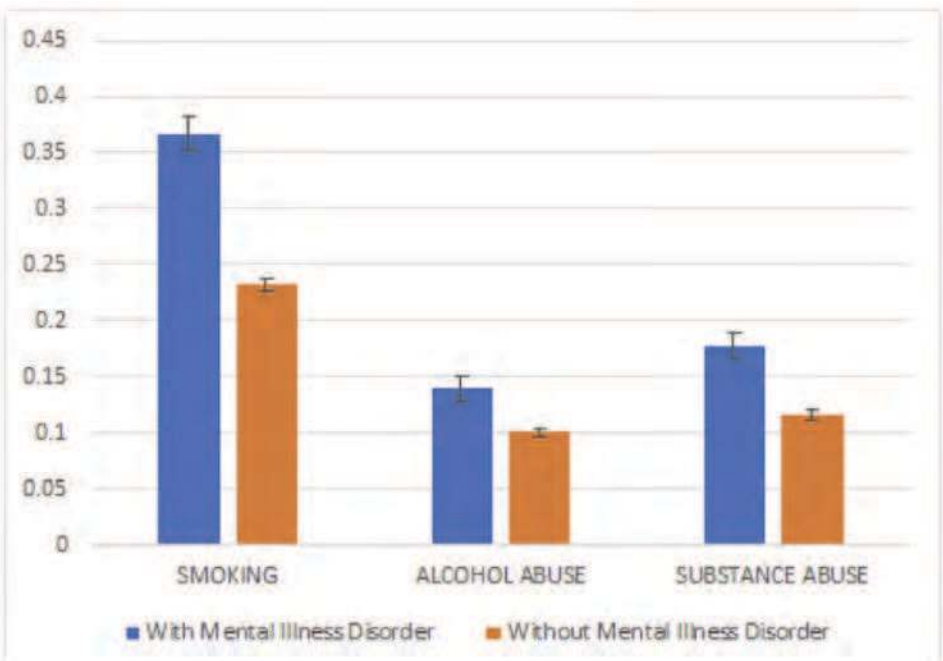


Figure 4: Prevalence differences in smoking, alcohol abuse, and substance abuse between patients with mental health disorder and patients without mental health disorder. Standard error bars are shown. There was a statistical significant difference (p-values <0.05) with individuals with underlying mental illness smoking, alcohol abusing, and substance abusing more often than individuals without a mental health disorder.

DISCUSSION

Individuals with mental health disorders are more likely to have dental and oral health concerns. Individuals with mental health disorders were more likely to show edentulism, dental caries, attrition, xerostomia, coated tongue, erosion, gingivitis, oral ulcers, and TMD. Periodontitis, bruxism, and periapical lesions were not significantly associated with mental health disorders in this study. The most frequent mental health disorder was depression, followed by anxiety. Individuals reporting a mental health disorder were more likely to be female and White.

Edentulism and tooth loss were significantly more prevalent in individuals reporting mental health disorders. Depression, specifically, has been associated with tooth loss linked to reduced self-care, number of medications being taken, and oral and systemic interplay.[5] Individuals with depression may be more likely to neglect esthetics and visit the dental professional less regularly. Furthermore, increased number of medications are directly related to xerostomia leading to dental caries and compromised oral hygiene. Similarly, dental caries was also more prevalent in individuals reporting a mental health disorder. Untreated dental caries is complicated by concurrent dental anxiety and phobia often exhibited by patients with psychological disorders.[4-6]

The association between mental health and periodontitis has been debated in the literature. In the present study, mental health disorders were not significantly related to periodontal disease. Similar studies did not find a significant association between mental health and periodontitis.[7,12] In other studies, depression has been considered an important risk factor for periodontitis.[8,13] Major depressive disorders may affect motivation and interest, as well as neuroendocrinological factors related to an impaired immune response.[14]

Erosion was noted more frequently in individuals reporting mental health conditions. Eating disorders and associated habits may be responsible for the increased incidence of erosion. However, Javadi and Shafikhani (2017) found that mental factors, specifically anxiety and depression, play important roles in the development of gastroesophageal reflux disorder (GERD).[15] Kamolz and Velanovich (2002) found that 60% of patients reported exacerbation of GERD symptoms during times of poor mental health.[16]

Baghaie *et al.* (2017) found that substance users suffered from greater dental caries and periodontitis. Despite more dental caries, individuals had fewer restored teeth suggesting reduced access to dental services.[11] Furthermore, individuals with alcohol dependency had lower salivary pH and higher prevalence of dental caries, periodontitis, and mucosal lesions compared to non-alcohol dependent controls.[17] Tobacco use and smoke exposure has been associated with dental caries as an acquired risk factor, related to salivary alterations and direct links to systemic disease.[18]

Psychological factors may affect temporomandibular joint function through muscle hyperactivity and biomechanical changes that can ultimately lead to pain.[19] Psychological factors can play a role in the etiology of facial pain and TMD symptoms. Conversely, chronic pain may cause depression and other psychological stressors. Individuals who reported chronic TMD pain had greater suicidal ideation, anxiety, and depression.[20] Nonetheless, Reiter et al. (2015) noted a less significant role of anxiety compared to depression. It is important to consider the reciprocal effects of psychological distress and oral health and their effects on one another.[21]

The choice of analysis is worth mentioning. We did not perform a regression analysis because the goal was not to understand which among the independent variables were related to the dependent variable, and to explore these relationships, maybe even to infer causal effects. We know that a deteriorated mental health status would lead to poorer oral hygiene that then leads to more severity of dental caries or the presence of gingivitis. Similarly, frequency of smoking is higher, which impacts periodontal status or dental caries. The demonstration that the presence of an underlying mental health disorder leads to higher frequencies of a number of oral health outcomes is noteworthy and should be enough to provide evidence that individuals with mental health disorders require personalized attention and likely different treatment approaches and preventive strategies to help stop worsening of oral health status.

Limitations of the study include small sample size and incomplete representation. A larger sample size encompassing a broader range of demographics and disorders would be more representative of the national population. It is also important to note that individuals often suffer from multiple mental disorders concurrently rather than just one. Future studies should investigate the specific behavioral changes affecting these individuals and their effect on dental health. It is important to understand the physical and physiological changes affecting patients with mental health disorders to deliver multidisciplinary treatment that meets their dental, oral, and psychological needs.

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OSTEOPOROSIS, TOOTH LOSS AND FUNCTIONAL DENTITION IN ELDERLY WOMEN: A CROSS-SECTIONAL STUDY

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Palavras-chave: Osteoporose. Saúde Pública. Doenças Periodontais. Perda de Dente. Idoso.

RESUMO

Objetivos: O objetivo deste estudo foi investigar se a osteoporose é um indicador de perda dentária e de falta de dentição funcional em idosas. **Métodos**: Um estudo transversal envolvendo mulheres com mais de 60 anos foi realizado na Odontoclínica Central da Marinha, Rio de Janeiro, Brasil. Dados demográficos e médicos foram obtidos através de entrevistas individuais. Os dentes naturais foram contados no exame oral. Mulheres com um ou mais dentes foram divididas em dois grupos: com e sem osteoporose. O número de dentes naturais foi comparado entre os grupos, com controle para tabagismo e diabetes mellitus. A associação entre a dentição funcional e a osteoporose foi avaliada por meio de odds ratios (OR) e seus respectivos intervalos de confiança de 95%. **Resultados**: Dentre 360 idosas cadastradas no banco de dados, 256 tinham registro de exame oral. Os grupos foram compostos por 55 mulheres com osteoporose e 201, sem. A prevalência de doenças crônicas e tabagismo foi semelhante entre os grupos. O número médio de dentes para mulheres com osteoporose foi significativamente menor do que as que não tinham a doença (14,69 ± 7,69 versus 18,19 ± 7,20, p = 0,002), permanecendo significativo após o ajuste para possíveis fatores de confundimento. Mulheres sem osteoporose tiveram maior chance de apresentar dentição funcional do que as outras (OR = 2,10, IC 95% [1,21-3,66], p = 0,006). **Conclusão**: A osteoporose foi um indicador de perda dentária e de ausência de dentição funcional na população estudada.

Keywords: Osteoporosis. Public Health. Periodontal Diseases. Tooth Loss. Aged.

ABSTRACT

Objectives: The objective of this study was to investigate whether osteoporosis is an indicator of missing teeth and lack of functional dentition in elderly women.**Methods**: A cross-sectional study involving women aged more than 60 years was performed at the Brazilian's Navy Dental Center (*Odontoclínica Central da Marinha)*, Rio de Janeiro, Brazil. Demographic data and general health status information of the group were obtained through individual interviews. In addition, the number of natural teeth was recorded in oral examination. Women presenting at least one tooth were divided in groups presenting or not osteoporosis. The number of natural teeth was compared between groups, with adjustment for smoking and diabetes *mellitus*. The association between functional dentition and osteoporosis was evaluated using odds ratios (ORs) and their respective 95% confidence intervals. **Results**: Data on oral examination were available for 256 of the 360 elderly women registered in the database. The groups were composed by 55 women with osteoporosis and 201 not presenting osteoporosis. The prevalence of chronic diseases and smoking, was similar between groups. The mean number of teeth for osteoporotic women was significantly lower than in those without this disease (14,69 ± 7,69 *versus* 18,19 ± 7,20, p= 0.002), remaining significant after adjustment for potential confounders. Women without osteoporosis exhibited greater chance to present functional dentition than those with osteoporosis (OR = 2.10, 95% CI [1.21 to 3.66], p =0.006). **Conclusion**: Osteoporosis was an indicator for tooth loss and lack of functional dentition in the studied population of elderly women.

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INTRODUCTION

Oral health is considered a relevant component of general health. An integrated health approach is fundamental to tackle the needs of the population.[1] The current interest on the influence of osteoporosis on oral health is evident.[2,3]

Osteoporosis is a systemic skeletal disease characterized by low bone mass. It is considered the most common metabolic disorder at older age and a serious worldwide epidemic.[4,5] This disease has also been pointed as a risk factor for periodontal disease and tooth loss.[6-8]

Tooth loss is associated with adverse oral health-related quality of life (OHRQoL). One of the most immediate and important functional consequences of tooth loss is the reduction in chewing ability.[9] Reduced dental arches that preserve basic functions, such as chewing, speaking and esthetics, are characterized as functional dentition. The World Health Organization (WHO) considers functional dentition when individuals present no less than 20 teeth throughout life, with no need for tooth replacement.[10] Natural teeth shall be preferred over artificial teeth and ensure greater satisfaction in comparison to tooth replacements.[9]

Some authors demonstrated an association between osteoporosis and tooth loss.[11-16] However, the literature is not conclusive on this issue. [17-18] These inconsistent findings might result from differences in sample sizes, age of the participants, gender, socioeconomic *status*, educational level, as well as different study designs. Thus, the association between tooth loss and osteoporosis should be further explored. The aim of this study was to investigate whether osteoporosis is an indicator of low number of natural teeth and lack of functional dentition in a population of elderly women.

MATERIALS AND METHODS

Study design

This was a cross-sectional study involving a population of 1629 patients assisted by the Preventive Dental Service at the Brazilian's Navy Dental Center (*Odontoclínica Central da Marinha/OCM*), Rio de Janeiro, Brazil, between June 2016 and December 2017. The OCM is a military institution that is a specialized health care dental center for patients referred from primary health care in need for advanced dental treatment. Although OCM is designated to perform specialized health care, the Preventive Dental Service is also responsible for primary dental care, including basic periodontal therapy and oral hygiene instruction. Militaries on service, veterans and their dependents are entitled for health care and treatment at OCM, in Rio de Janeiro, Brazil.

Participants

Patients who attended the Preventive Dental Service for the first time between June 2016 and December 2017 were included in the study. Those who were on maintenance periodontal treatment were excluded. Women aged 60 years or more, with one or more natural teeth were eligible for the present study. Completely edentulous individuals are not referred to the Preventive Dental Service. This study was approved by the Research Ethics Committees of the Hospital Naval Marcílio Dias, register 78923017.6.0000.5256, and was in accordance with the Declaration of Helsinki ethical principles.

Data collection

Data was obtained through individual interviews about general health conducted by trained and blinded examiners, as part of the routine procedure of the Preventive Dental Service in the first dental appointment.

Demographic data included age and military situation (on service, veteran or dependent). The social and clinical data were collected regarding being a smoker, overweight, and presenting diabetes *mellitus* (DM), and osteoporosis. Overweight was considered if the body mass index (BMI) was greater than or equal to 25.0. BMI was defined as the weight (in kilograms) divided by the height squared (in meters).

The number of natural teeth was counted on clinical examination. Functional dentition was considered absent when there were less than 20 natural teeth, and present when there were 20 or more teeth.[9]

Numerical data were: age (in years), body mass index (BMI) and number of natural teeth.

Data Analysis

A descriptive analysis was performed for demographic, social and clinical data. The frequencies of the categorical variables and means (± standard deviation) of the numerical variables were obtained for the two groups of elderly women.

The mean number of teeth was compared between women who presented or not osteoporosis. A stratified analysis was performed in order to explore whether smoking and diabetes *mellitus* influenced this relationship. Additionally, the association between functional dentition and osteoporosis was evaluated using odds ratios (ORs) and their respective 95% confidence intervals.

Statistical differences between groups were evaluated using the chi-square test for categorical variables, and Mann Whitney for continuous variables, with a significance level of 5%. All data processing and analyses were performed using the software SPSS version 21.0 ("*Statistical Package for the Social Sciences*", SPSS Inc., Chicago, USA).

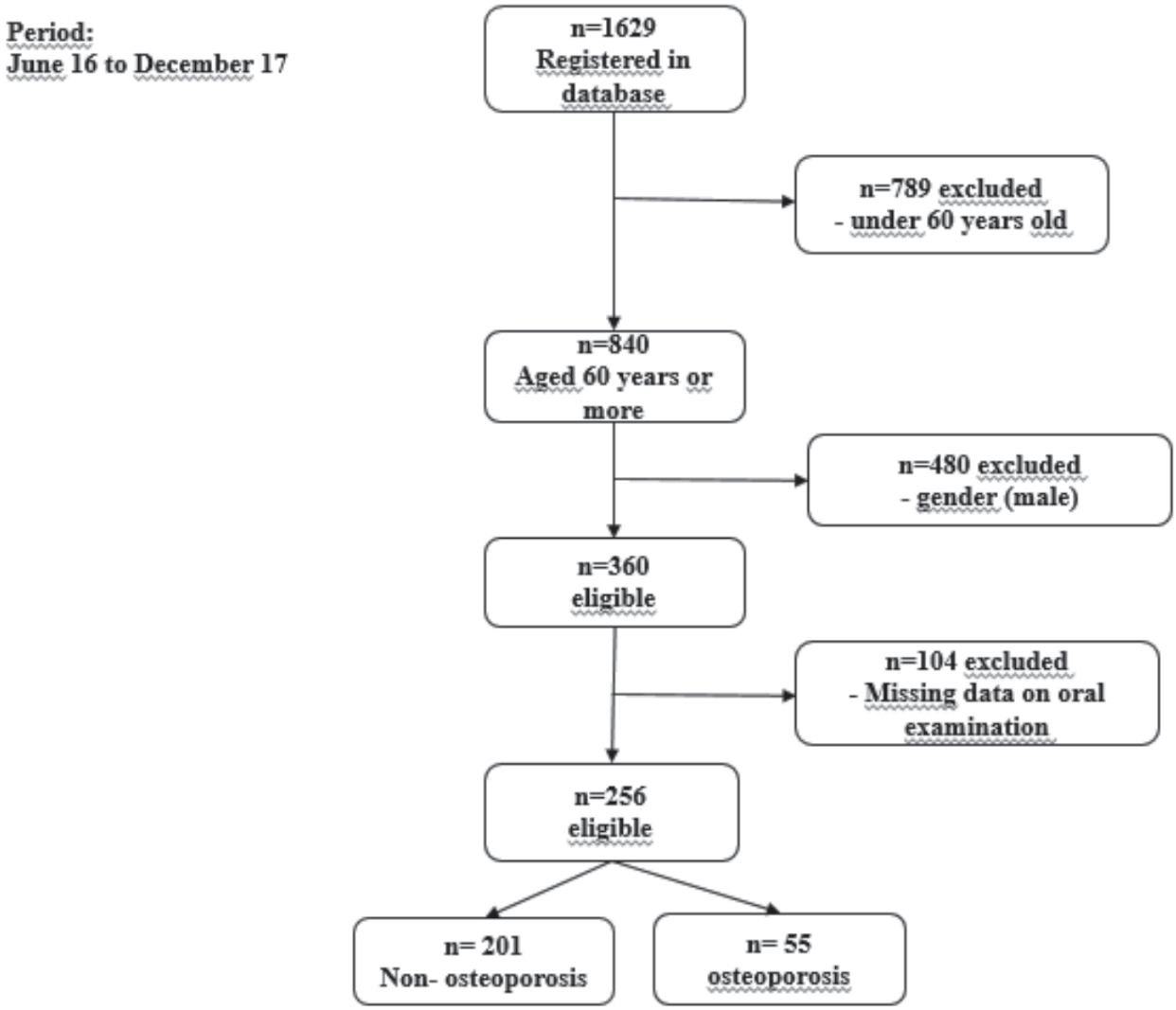


Fig.1 *Flow chart of the sample selection.*

RESULTS

There were 1,629 registered patients in the database of the Preventive Dental Service from June 2016 to December 2017. From the 360 elderly women registered in the database, there were data on oral examination available for 256 of them. These women composed the two groups: non-osteoporosis (n=201) and osteoporosis (n=55). Figure 1 shows a flowchart of the participants.

The descriptive statistics results are presented in Table I. The prevalence of smokers and individuals with chronic diseases, such as diabetes *mellitus* and hypercholesterolemia did not differ between groups.

The comparisons between groups of elderly women (with or without osteoporosis) and the stratified analysis are shown in Table II. Women with osteoporosis showed a significant lower number of teeth than those without osteoporosis (14,69 ± 7,69 *versus* 18,19 ± 7,20, p= 0.002). This association remained significant after adjustments for diabetes *mellitus* and smoking.

Table III shows the results on the association between osteoporosis and functional dentition. Women who did not present osteoporosis were more likely to present functional dentition than the women with osteoporis (OR = 2.10, 95% CI [1.21 to 3.66], p =0.006). Adjustments for diabetes mellitus and smoking were not performed because these conditions were not confounders, as observed previously.

***Table 1**: Descriptive analysis of the sample, according the two groups.*

Characteristics	Groups			
	Total	Non-osteoporosis	Osteoporosis	p
Age	68.44±6.24	68.11±6.01	69.64±6.82	0.15
Diabetes mellitus	56 (21.9)	44 (21.9)	12 (21.8)	0.99
Smoking16	(6.3)	14 (7)	2 (3.6)	0.53
Hypercholesterolemia	70 (27.3)	57 (28.4)	13 (23.6)	0.61
Overweight	140 (61.1)	113 (62.1)	27 (57.4)	0.62
Body Mass Index	26.81±4.88	26.78±4.71	26.92±5.55	0.92
Number of teeth	17.44±7.44	18.19±7.20	14.69±7.69	0.002

p value*: significance level d" 0,05; Mann-Whitney test for continuous variables and Qui-square for categorical variables; SD: standard-deviation. Data expressed as mean ± SD or absolute number (%).*

***Table 2**: Comparison between the mean number of teeth after adjustments for DM and smoking.*

	Non-Osteoporosis	Osteoporosis		
		Total	Excluding	
	n = 201	n = 55	*DM* n = 43	smoking n = 53
Number of teeth (mean ± SD)	18.19±7.20	14.69±7.69	15.49±7.72	14.92±7.71
p		0.002*	0.035*	0.005*

***Note**: * p value: significance level d" 0.05; Mann-Whitney test*
DM: diabetes mellitus*; SD: standard deviation*

***Table 3**: Odds ratio (OR) and confidence interval for the association between non-osteoporosis and functional dentition.*

	Women with functional dentition (n=107)	
	Non-Osteoporosis	Osteoporosis
Functional Dentition: n (%)	93 (86.9)	14 (13.1)
Odds Ratio (Confidence Interval)	2.10 [1.21 to 3.66]	
p	0.006*	

***Note:** * p value: significance level d" 0.05*

DISCUSSION

The present results involving 256 postmenopausal women who had similar clinical and demographic characteristics, suggest that the number of natural teeth was lower in women with osteoporosis than those without this disease. Additionally, neither diabetes *mellitus* nor smoking, influenced this finding.

These results are in accordance with previous studies.[11-16] Our study sample was composed only by elderly women, because the effects of osteoporosis seem more meaningful in this population.[19] Studies involving young populations and perimenopausal women, where osteoporosis is less prevalent, are more likely to not show such association.[20] May et al.[21] did not find the same association of this paper. This can be explained because, in the present study, the number of teeth was clinically counted, while the other was based on self-reporting of tooth loss in elderly women.[21]

Elderly women from the non-osteoporosis group presented similar mean number of teeth as the whole amount of individuals aged over 60 years registered in database (respectively, 18.19 ± 7.20 and 18.03 ± 7.68; data not shown). This information highlights the possible negative role of osteoporosis on tooth retention.

One possible link between osteoporosis and tooth loss is the simultaneous systemic and alveolar bone resorption. The reduced systemic bone mineral density may have a negative effect on the jawbone quantity and quality.[13] It was reported that women with osteoporosis have a higher risk of tooth loss, and may undergo greater alveolar bone resorption after tooth loss, compared with healthy women of the same age range.[22] Results of a meta-analyses showed that women with osteoporosis and osteopenia present greater periodontal attachment loss when compared to women with normal bone mineral density.[8] A strong body of literature supports the relationship between osteoporosis and periodontal attachment loss or tooth loss. Periodontal disease remains one of the most common causes of tooth loss among adults.[23]

Tooth loss may reduce functional capacity of chewing and biting, self-esteem and social relationships.[24] It was postulated that tooth loss may be a predictor of shortened longevity and that greater retention of teeth may contribute to a longer lifespan. Oral well-being and functioning are crucial for quality of life.[6] Data from the 2013 National Health Survey revealed that the loss of 13 or more teeth was more frequent (67.4%) among individuals aged 60 and older.[25] The SB Brasil 2010 has shown that the mean number of missing teeth in individuals aged 65 to 74 years was 25.4.[26]

WHO points that the relative increase in the percentage of older people (65–74 years) who have a functional dentition is a relevant indicator to be used in the evaluation of oral health.[21] In 2003, the prevalence rate of functional dentition among Brazilian adults was 54%.[27] There is a need to improve oral health of status of adult population, by increasing the amount of people with functional dentition.[24] The occurrence of osteoporosis may possibly make this goal more difficult to be reached, as our study showed that the presence of functional dentition was lower among elderly women with osteoporosis, when compared to non-osteoporotic women .

Some limitations must be considered when interpreting our findings. One of them is the possible role of information bias on the findings since smoking and comorbidities, like diabetes *mellitus* and osteoporosis were self-reported conditions. We did not have information on the use of medications for osteoporosis, which may improve periodontal *status* and, possibly, prevent tooth loss caused by periodontitis.[28,29] Another point is the lack of information on the reasons for tooth loss. Although periodontal disease is the main cause of tooth loss at older ages, other factors contribute to human tooth loss, like dental caries, access to dental services, education level, among others. Moreover, the sample was selected in a convenience way. This sample may not represent the general elderly population, since edentulous women were excluded and all participants have access to dental care service. Finally, our findings limit the causal inference between osteoporosis and tooth loss because of the cross-sectional design. Prospective studies are necessary to confirm whether osteoporosis is a risk factor for tooth loss. These studies should investigate the causes of tooth loss and examine whether they are correlated to systemic bone mineral density, controlling for the use of antiosteoporosis drugs.

Risk factor researches aim to move closer to the direct causes of the diseases, and to prevent or reduce the risk at the population and individual levels.[30] There are some clinical implications associated to the results of the present study. Preventive strategies are fundamental for reaching advanced ages with functional dentition and good oral health. As part of the multiprofessional health care team, the dentists should be aware of systemic risk factors for oral health, like osteoporosis, contributing to patients' knowledge about their systemic skeletal condition. Once having the diagnosis of osteoporosis, women should initiate the management and treatment of the disease as soon as possible in order to minimize the negative impact of the condition on teeth supportive tissues.

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ACCURACY OF THE INITIAL DIAMETER OF FINISHING FILES AND GUTTA-PERCHA CONES OF THE PROTAPER UNIVERSAL® SYSTEM

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Palavras-chave: Acurácia da Medição Dimensional. Cone de Guta-percha. Instrumentos Dentários. Instrumentos Rotatórios de Ni-Ti.

RESUMO

Objetivo: Analisar a acurácia do diâmetro inicial dos instrumentos de acabamento do sistema ProTaper Universal® e seus respectivos cones de guta-percha. **Método**: Foram utilizados instrumentos de acabamento do sistema ProTaper Universal® F1, F2, F3, F4 e F5 e cones de guta-percha ProTaper correspondentes (10 de cada). O projetor de perfil foi usado para avaliar o diâmetro inicial dos instrumentos e cones. Todas as medições foram feitas duas vezes por um único operador treinado. Uma análise descritiva do diâmetro inicial dos instrumentos foi realizada considerando o limite de tolerância proposto pela ADA número 101. De acordo com essa norma, os instrumentos F1, F2 e F3 tem um limite de tolerância de ± 0.025 mm e os instrumentos F4 e F5 ± 0.05 mm. O mesmo limite de tolerância foi utilizado para avaliar os cones. Os diâmetros iniciais dos instrumentos e cones estudados foram comparados com os valores nominais dados pelo fabricante através do teste T (pd"0.05). **Resultados**: Foi verificada acurácia somente do cone de guta-percha ProTaper do grupo F5 (p>0,05). Nenhum grupo de instrumento de acabamento apresentou acurácia (pd"0,05). Foi verificado que 30% (n=15) dos instrumentos de acabamento e 20% (n=10) dos cones excederam o limite de tolerância. **Conclusão**: Acurácia não foi verificada em nenhum instrumento ProTaper Universal® e somente o cone F5 apresentou acurácia. A maioria dos instrumentos e cones estavam dentro do limite de tolerância proposto pela ADA.

Keywords: Dimensional Measurement Accuracy. Gutta-percha Cone. Dental Instruments. Ni-Ti rotary files.

ABSTRACT

Objective: to assess the accuracy of the nominal initial diameter of ProTaper Universal® finishing files and their respective gutta-percha cones.

Method: ProTaper Universal® finishing files, F1, F2, F3, F4 and F5 and corresponding ProTaper cones were used (10 of each). A Profile Projector was used to evaluate the initial diameter of files and cones. All measurements were repeated twice and performed by a single trained operator. A descriptive analysis of the files' initial diameters was performed considering the tolerance limit established by the ADA number 101. According to this standard, the files F1, F2 and F3 have a tolerance limit of ± 0.025 mm and the files F4 and F5 ± 0.05 mm. The same tolerance limit was used to evaluate the cones. The initial diameters of the instruments and cones studied were compared with the nominal values given by the manufacturer through Student's T test (pd"0.05). **Results**: No finishing file group showed adequate accuracy (pd"0.05). Accuracy was verified only from the F5 ProTaper cone group (p> 0.05). It was verified that 30% (n=15) of the finishing files and 20% (n = 10) of the cones exceeded the tolerance limits. **Conclusion**: Accuracy was not observed for any file and it was identified only in the F5 ProTaper Universal® cone. Most files and cones were within the tolerance limits established by the ADA.

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INTRODUCTION

Although there are specific standards for the manufacture of standardized files and gutta-percha cones,[1] studies have reported variability in the diameter and taper of both.[2-4] This variation may lead to errors such as difficulty in reaching the working length of the subsequent file,[5] facilitating apical transportation,[5]and difficulty in choose master cone and during the filling.[6]

The rotary files have a specific diameter and taper, so manufacturers offer in gutta-percha points for each system. Different studies have been published for the purpose of evaluating the diameters and taper of these systems.[7,8-11] According to some studies, the actual diameters of the files and cones differ from the nominal diameters .[7,8,10,11]

Among the rotary systems available, the ProTaper Universal® system (Dentsply, Maillefer, Ballaigues, Switzerland) stands out for its widespread use even after the release of the ProTaper Next® system (Dentsply, Maillefer, Ballaigues, Switzerland), a new version of ProTaper Universal®. In this system, the nominal values of the initial diameter (D_0) and the taper as a percentage are informed. Among the studies that evaluated the diameter of ProTaper Universal® files and cones,[4,9-11] Chesler et al.[9] evaluated the F3 files and reported that they had a diameter smaller than the nominal diameter. Islambasic et al.[11] verified that the F2 files did not have values similar to nominal. Castilho et al.[4] evaluated the D_0 diameters of F2 and F3 cones and verified that all had appropriate values. However, the authors considered a tolerance limit of ± 0.01 mm. Oliveira et al.[10] evaluated the F1, F2 and F3 cones and found that the F2 and F3 cones did not meet the ANSI/ADA number 78 recommendations and presented several types of defects.

The authors are not aware of any studies that evaluated the D_0 diameter of F1, F4 and F5 files and the gutta-percha cones F4 and F5. Thus, this study aimed to assess the accuracy of the D_0 diameter of ProTaper Universal® finishing files and of the respective gutta-percha cones.

MATERIALS AND METHODS

In the present study, ProTaper Universal® finishing files F1, F2, F3, F4 and F5 and corresponding ProTaper cones were used (10 of each) of varied batchs.

A Nikon Profile Projector (6C-2 - Nippon-Tokyo, Japan) was used to evaluate the D_0 diameter of files and cones. For this, the files and cones were positioned on the table of the profile projector with the aid of utility wax (Technew, Brazil) to confer stability. The "Shadow" option of the equipment was chosen to perform file and cone measurements through the projected shadow on the screen.

The baseline of the profile projector, which is represented by a horizontal line projected on the screen, was positioned tangentially to both the upper (Figure 1) and the lower profiles of the samples. The measurements recorded in the upper and lower profile of the D_0 were subtracted, establishing the diameter through the vertical movement of the table. Due to oscillations of the projected profile of the ProTaper Universal® files, the baseline was adequate through the tangent formed by the turns closest to D_0. All measurements were repeated twice and performed by a single trained operator.

The nominal D_0 diameter of the ProTaper Universal® F1, F2, F3, F4, and F5 files and cones are 0.20 mm, 0.25 mm, 0.30 mm, 0.40 mm and 0.50 mm, respectively. A descriptive analysis of the files' D_0 diameters was performed considering the tolerance limit established by the ADA guidelines number 101.[12] According to this standard, the files F1, F2 and F3 have a tolerance limit of ± 0.025 mm and the files F4 and F5 ± 0.05 mm. There is no standardization for the cones' corresponding rotary files. Thus, the same tolerance limit that was used for the files was also used for the cones.

The data were analyzed using the SPSS 16.0 program (IBM



Figure 1: *The baseline of the profile projector positioned tangentially to the upper profile of the file sample.*

SPSS Statistics, Chicago; USA). The mean and standard deviations of the D_0 diameters were determined and the accuracy of the files and cones within each group was evaluated through Student's T-Test. The level of statistical significance was 0.05.

RESULTS

Table I and Table II shows the means and standard deviations of the D_0 diameters of the ProTaper Universal® files and cones, respectively. The files groups F1, F4 and F5 presented mean values lower than the nominal diameter. All cones groups presented mean values higher than the nominal diameter. While No finishing files group showed the desired accuracy (pd"0.05). It was verified that only the ProTaper gutta-percha cone F5 group were dimensionally accurate (p>0.05).

Table III presents a descriptive analysis considering the tolerance limits of the files and cones. Only the cones F5 group presented all the samples within the tolerance limit followed by the file group F1 and the cones groups F2 and F4 that presented 90% of the sample within the tolerance limit. It was also verified that there was a tendency for the files to have lower actual diameters in groups F1, F4 and F5 and for the cones to have actual diameters higher than nominal.

***Table 1**: Mean and standard deviation (SD) of the D_0 diameter of the ProTaper Universal® files (mm)*

Sample	F1	F2	F3	F4	F5
1	0.195	0.283	0.319	0.406	0.491
2	0.156	0.260	0.313	0.356	0.489
3	0.185	0.260	0.319	0.370	0.488
4	0.207	0.309	0.339	0.323	0.502
5	0.184	0.197	0.313	0.412	0.480
6	0.193	0.239	0.315	0.365	0.391
7	0.197	0.272	0.328	0.355	0.454
8	0.192	0.306	0.319	0.371	0.463
9	0.197	0.219	0.303	0.367	0.411
10	0.179	0.284	0.326	0.333	0.420
Mean	0.189	0.263	0.319	0.366	0.459
SD	0.014	0.036	0.010	0.028	0.039

***Table 2**: Mean and standard deviation (SD) of the D_0 diameter of the ProTaper Universal® cones (mm)*

Sample	F1	F2	F3	F4	F5
1	0.266	0.250	0.323	0.426	0.518
2	0.214	0.266	0.302	0.409	0.497
3	0.249	0.255	0.298	0.459	0.515
4	0.225	0.260	0.332	0.409	0.510
5	0.203	0.272	0.347	0.435	0.450
6	0.244	0.262	0.299	0.422	0.512
7	0.238	0.297	0.299	0.438	0.493
8	0.217	0.261	0.320	0.387	0.488
9	0.271	0.253	0.322	0.445	0.523
10	0.221	0.254	0.337	0.416	0.511
Mean	0.235	0.263	0.318	0.425	0.502
SD	0.023	0.014	0.018	0.021	0.021

***Table 3**: Frequency of files and cones that were within tolerance limits*

Group	F1	F2	F3	F4	F5
Files	9[a]	4[a]	7[a]	8[b]	7[b]
Cones	5[a]	9[a]	7[a]	9[b]	10[b]

***Note**: [a]tolerance limit of ± 0.025 mm; [b]tolerance limit of ± 0.05 mm*

DISCUSSION

The rotary files and their respective gutta-percha cones may exhibit dimensional variability, presenting diameters higher or lower than the nominal specifications.[9,10] These variations may cause errors in instrumentation such as apical deviation[5] and difficulty in selecting the master cone at obturation.[3] Although the ProTaper Universal® system is widely used, few studies have evaluated the actual diameters of its files and cones.[4,9-11]

In order to measure the files' and cones' D_0 diameters, a profile projector was used as it allows accurate and reliable measurements.[10,13] However, other studies have used methods such as digital imaging obtained by an optical microscope,[14] a measuring microscope,[3,8] a scanning electron microscope [11] and a digital caliper.[4] Only D_0 was measured because the accuracy and consequent compatibility of files and cones in this regard have a direct influence on the quality of apical sealing. [4]

The absence of accuracy was verified from the results of the present study for all groups of finishing files and cones of groups F1, F2, F3 and F4. A similar result was observed by Chesler et al.[9] when evaluating the ProTaper F3 files and by Islambasic et al.[11] when evaluating ProTaper F2 files. It was also verified that there was a tendency for the files to have lower actual diameters in groups F1, F4 and F5 and for the cones to have actual diameters higher than nominal. The same finding was verified by Chesler et al.[9] when evaluating the ProTaper F3 files and Oliveira et al. (10) when evaluating the ProTaper F1, F2 and F3 cones. This incompatibility may hamper the obturation time, as well as introduce errors during instrumentation.[5,6,10]

In the present study, the tolerance limits proposed by ADA number 101 [12] were used, which states that the diameter of the nickel-titanium files should be within 50% of the difference of the nominal diameter of the next smaller file and/or of the next larger file. Considering this tolerance limit, 30% (n=15) of the finishing files exceeded this limit. However, there is no standardization for the cones' corresponding rotary files. Thus, the same tolerance limit that was used for the files was also used for the cones.[12] It was verified that 20% (n=10) of the cones exceeded this limit. In contrast, Castilho et al.,[4] when establishing the tolerance limit of ± 0.01 mm, verified that no cones from the F2 or F3 groups exceeded that limit. Another study verified that 75% of the ProTaper cones F2 were within the tolerance limit of ± 0.07 mm. [9] The use of different values of cones tolerance limit between studies,[4,9] makes it difficult to compare them.

In the present study, the diameter variability beyond the tolerance limits of files and cones can be considered to be high. This suggests the need for greater control over the manufacturing processes to ensure better standardization of files and cones. In addition, clinical studies should be performed taking into account factors such as shape and dimension of canals, since in this study only the virtual space created by the files was evaluated and the cutting capacity of the dentin was not taken into account. Due to the lack of accuracy inherent to most cones, we recommend that dental professionals be prepared for any difficulties during the selection of the master cone.

Based on the results of the present study, dimensional accuracy was verified only for the ProTaper Universal® F5 gutta-percha cone. No ProTaper Universal® finishing files exhibited complete accuracy. Most files and cones were within tolerance limits.

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MULTIDISCIPLINARY AESTHETIC REHABILITATION: CASE REPORT

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Palavras-chave: Reabilitação Bucal. Estética Dentária. Aumento da Coroa Clínica. Freio Labial. Ortodontia.

RESUMO

Objetivo: Este trabalho visa relatar um caso clínico que realizou a reabilitação estética de um paciente por meio da integração de diferentes especialidades odontológicas (Ortodontia, Periodontia e Dentística). **Relato do Caso**: Paciente do sexo feminino, com 18 anos, recebeu tratamento ortodôntico compensatório para correção de má-oclusão classe II, overbite e overjet acentuados, e diastemas interproximais. Após tratamento ortodôntico, foi realizada uma gengivoplastia para a remoção do excesso de tecido gengival e aumento da coroa dos dentes, e uma frenectomia para a remoção do freio labial anômalo. Após o tratamento periodontal, foi realizado um clareamento dentário de consultório, e o fechamento dos diastemas anterosuperiores e o recontorno da cosmética dos dentes com resinas compostas microhíbridas. **Conclusão**: Concluiu-se que o planejamento integrado multiprofissional possibilitou o êxito da reabilitação estética/funcional do paciente.

Keywords: Mouth Rehabilitation. Dental Esthetics. Crown Lengthening. Labial Frenum. Orthodontics.

ABSTRACT

Objective: This work aims to report a clinical case that performed the aesthetic rehabilitation of a patient through the integration of different dental specialties (Orthodontics, Periodontics and Dentistry). **Case Report**: An 18-year-old female patient received compensatory orthodontic treatment for correction of class II malocclusion, overbite and overjet, and interproximal diastema. After orthodontic treatment, a gingivoplasty was performed to remove excess gingival tissue and increase the crown of the teeth, and a frenectomy for the anomalous labial frenulum removal. After periodontal treatment the in-office bleaching was conducted, and the diastema was closed with microhybrid composite resins. **Conclusion**: It was concluded that multiprofessional planning made possible the aesthetic / functional rehabilitation of the patient.

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INTRODUCTION

The appearance of teeth forms part of the overall picture of the facial esthetics, thus dentistry incessantly seeks to meet the esthetic demands of finding a perfect harmony between the white and pink architecture, mainly in the anterior area, which must be pleasant and natural, in order to boost both patient confidence and satisfaction.[1,2]

The equilibrium of the dentogingival relationship is a major factor in the constitution of an esthetic smile and may be related to the extent of the exposed gingival tissue. Exposure of more than 3 cm of gingival tissue when smiling, or short clinical crowns of the anterior superior teeth, generally is regarded as unpleasing for the patient.[1,3] Esthetic periodontal surgeries such as gingivoplasty are usually indicated for resolving these problems.[4]

Another negative factor in self-perceived dental appearance is anterior maxillary diastemas, being a primary concern in dental consultation. For their closure, direct composite restoration is highly promoted, since it conserves more tooth structure, has a lower cost and is reversible. The alternative use of ceramic laminates involves laboratory stages, elevating the treatment's cost as a disadvantage.[2,5] Teeth diastemas along with short clinical crowns cause esthetic discomfort to the patient. Midline diastema, which is treated with a frenectomy, is related to improper attachment of the labial frenum; when associated with other periodontal surgeries such as crown lengthening, it allows closure of the diastema without compromising the symmetrical equilibrium between the width and height of the crown, and without biological space invasion and impairment of periodontal health.[6-8]

This paper aims to present a clinical case report of esthetic rehabilitation of a patient, through the integration of different specialties (orthodontics, periodontics and restorative dentistry).

CASE REPORT

This clinical case was carried out at the School of Dentistry, UFPA. The 18-year-old female patient had previously received compensatory orthodontic treatment for correction of a class II malocclusion, accentuated overbite and overjet, and interincisal diastema (Figure 1). After completion of this treatment, the patient presented 2–3 mm of sulcus depth with a periodontal probe, and absence of inflammation, bleeding, caries or defective restorations. Besides this, anterior short clinical crowns and persisting midline maxillary diastema were present, this last related to an upper labial frenum with low attachment inserted close to the gingival margin, which could cause difficulty for hygiene, loss of the papilla and gingival recession in the area.

To obtain an ideal oral environment and occlusal conditions, esthetic rehabilitation of the anterior teeth was pursued through a dento-facial analysis. The treatment plan consisted of a gingivoplasty surgery on the maxillary anterior region, followed by upper lip frenectomy. Also, tooth bleaching was indicated, with concomitant recontouring of the upper anterior teeth with direct composite resin, for diastema closure. Informed consent was obtained from the patient prior to treatment; the clinical procedures to be performed were detailed, and she agreed to publication of the results, maintaining ethical principles.

Periodontal surgery

A pre-surgical picture of the patient's smile was taken (Figure 2a); subsequently, infiltrative local anesthesia and isolation of the operative field with sterile gaze were performed.



***Figure 1**: Initial intra-oral photos (pre-orthodontic treatment), demostrating increased overbite and overjet, and dental superior diastemas.*

The superior labial frenectomy was initiated by gripping the frenum with a hemostatic forceps and drawing a V-shaped incision on its base with a 15C scalpel blade attached to the scalpel handle (Quinelato, Rio Claro, SP, Brazil). The periosteum was fenestrated at the mucogingival line height, defining the new insertion point for the maxillary labial frenum (Figure 2b). The suture was performed with a 4.0 silk thread (Procare, Rio de Janeiro, RJ, Brazil) (Figure 2c).

After frenectomy, a gingivoplasty surgery was performed, beginning with demarcation of the probe depth so that the external bevel-type incision could be oriented. Through demarcation of bleeding points, the incision was performed with the aid of a 15C scalpel blade (Lamedid Solidor, Osasco, SP, Brazil) along the gingival margin of the superior teeth, from canine to canine (Figure 2d).

The patient was instructed to use a 0.12% chlorhexidine digluconate mouthwash for 14 days. The frenectomy suture was removed within a 7-day postoperative period, and the patient reported great satisfaction with the preliminary results. Weekly post-surgical evaluations were performed during a 30-day period; no complications were reported, and there was complete tissue repair.



Figure 2: (a) Pre-surgical gingival condition, after orthodontic appliance removal (b) V-shaped incision of upper lip frenulum (c) Suture of the incision (d) Gingivoplasty surgery for crown lengthening.

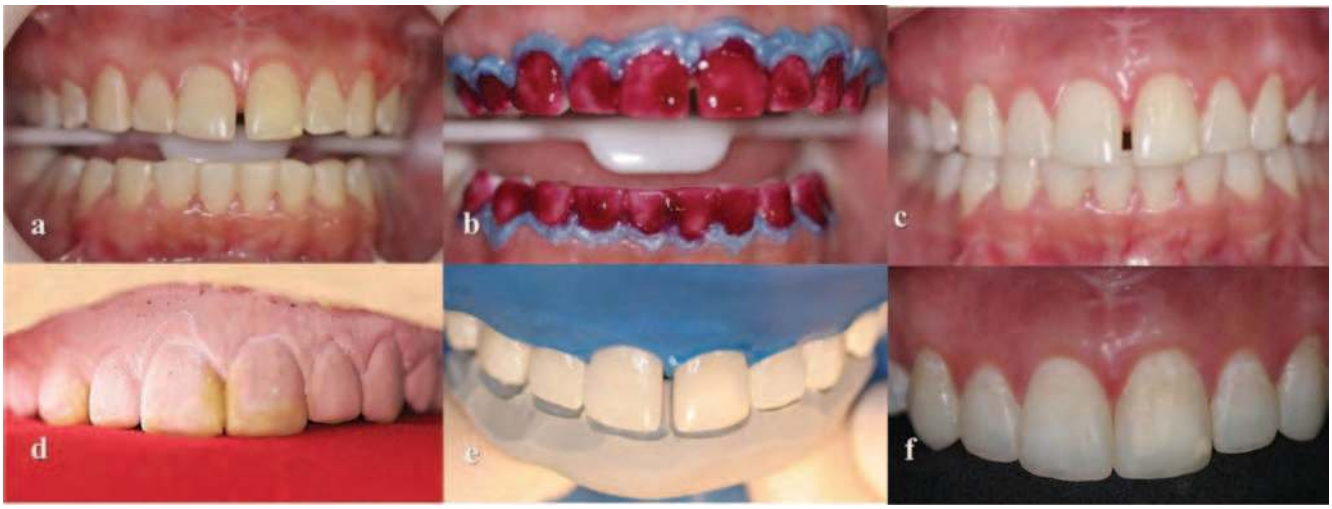


***Figure 3**: (a) 3 months post-surgical gingival condition (b) Isolated field, and application of 35% of hydrogen peroxide, during 45min (c) Teeth after bleaching treatment (d) Wax-up of the model, to create a silicon guide (e) Silicon guide in position, operative field isolated with rubber dam (f) Teeth before the finishing and polishing steps.*

Tooth bleaching

Three months after the surgery (Figure 3a), a prophylaxis with bristle brushes and water/pumice paste was performed (S.S. White, São Cristovão, RJ, Brazil). Then, the initial color (A3/2M2) of the patient's teeth was selected using a spectrophotometer (Easyshade Advance 4.0, Vita Zahnfabrik, Bad Säckingen, WT, Germany).

The gingival tissue of the teeth to be bleached was isolated using a resinous gingival barrier (Top Dam, FGM, Joinville, SC, Brazil), that was polymerized for 30 s (Radii-cal, SDI, Bayswater, VIC, Australia). A 35% hydrogen peroxide (HP) solution was applied on the upper and lower incisors, canines and premolar teeth; three applications of 15 min each were completed, for a total time of 45 min in one session (Figure 3b).

Three bleaching sessions were performed, with a 7-day interval between them. At the end of every session, the teeth were polished with polish paste (Diamond Excel, FGM, Joinville, SC, Brazil) and felt discs (Diamond Flex, FGM, Joinville, SC, Brazil), followed by application of a nanohydroxyapatite-based desensitizing agent (Desensibilize Nano P, FGM, Joinville, SC, Brazil), for 10 min.

Restorative procedure

Thirty days after the end of the tooth-bleaching sessions (Figure 3c), the anterior upper teeth were submitted to re-anatomization. After alginate impression to obtain diagnostic casts, a diagnostic wax-up was performed (Figure 3d); using the golden ratio as a reference, a silicone guide was made to orientate execution of the restorations (Figure 3e).

Absolute isolation of the operative field was performed with a rubber dam. The enamel surface was roughened with a number 3203 diamond-coated bur (KG Sorensen, Cotia, SP, Brazil) on high speed. The adhesive protocol involved 37% phosphoric acid etching (Condac 37, FGM, Joinville, SC, Brazil) for 15 s, followed by the application of a thin and homogeneous adhesive layer (Ambar, FGM, Joinville, SC, Brazil) that was photo-activated for 20 s (Radii-cal, SDI, Bayswater, VIC, Australia).

Microhybrid resins (Opallis, FGM, Joinville, SC, Brazil) were used for the composite resin stratification process which was started by making up the incisal edge with T-Neutral shade (Opallis, FGM, Joinville, SC, Brazil), allowing visualization of its characteristic translucency and incisal third nuances. Opaque White resin (Opallis, FGM, Joinville, SC, Brazil) served for opacification and hiding the black background. For enamel, EA2 (Opallis, FGM, Joinville, SC, Brazil) was inserted, without extending to the area corresponding to the incisal edge, to reproduce the mamelon shape, while DA2 was used for dentin reproduction.

To complete the restorative stage (Figure 3f), fine- and extra-fine-grained diamond-coated burs (2135F and 2135FF, KG Sorensen, Cotia, SP, Brazil) were used, and the polishing was done with the aid of diamond paste for composites (Diamond Excel, FGM, Joinville, SC, Brazil), with sand paper discs (Diamond Pro, FGM, Joinville, SC, Brazil) and felt discs (Diamond Flex, FGM, Joinville, SC, Brazil). Finally, the clinical aspects before and after the esthetic rehabilitation are shown in Figure 4a and b.



***Figure**: 4 (a) Initial smile, after orthodontic appliance removal (b) Smile after the multidisciplinary esthetic rehabilitation treatment.*

DISCUSSION

In the present clinical case, the patient was unsatisfied with her smile, even though orthodontic treatment had improved the overbite and overjet, as well as her facial profile. It has been noticed that in a great number of cases, an esthetically acceptable outcome cannot be obtained through an isolated orthodontic approach. Generally, adjunctive periodontal or restorative procedures are required to accomplish an ideal result.[8] Clinically, it was possible to establish some considerations that led to the indication of gingivoplasty surgery associated with frenectomy and bleaching of the anterior teeth, along with esthetic re-anatomization.

The characteristic diastema of the upper labial frenum is naturally closed after the upper lateral incisors and permanent canines erupt. In cases where closure does not occur, the inferior position of an anomalous frenum can be related to the diastema.[9,10] There is no consensus in the literature about whether maxillary labial frenum hypertrophy is the cause or consequence of midline diastema, or about the ideal intervention period.[7] Frenum hypertrophy could be an etiological factor for re-opening of the diastema, after orthodontic treatment is concluded. Furthermore, it interferes with the patient's esthetics and phonetics.[11]

Midline diastema usually involves orthodontic treatment, in which the forces act by depriving blood vascularization of the transseptal fibers, and new fibers are formed to replace the old ones destroyed by the induced ischemia. Removal of the hypertrophic frenum after the conclusion of orthodontic treatment is suggested, as the newly developed tissues should contribute to the stability of the final result.[12,13] In this clinical case, the frenectomy was performed 2 weeks after conclusion of the orthodontic treatment, as the frenum remained inferiorly positioned and it could have induced an alteration of oral health integrity.

A gingival smile is caused by excessive tissue partially covering the anatomical crown of the teeth, or by altered passive eruption. Gingival surgery is recommended in order to position the gingival margin more apically, without exposing the root surface, observing the amount of keratinized gingiva and the relationship between the cementoenamel junction, gingival margin and the crest of the alveolar bone. Gingivoplasty leads to excellent results, quickly restoring the dentogingival esthetic sought by the patient, through a simple and ambulatory procedure, with local anesthesia.[14]

Besides orthodontic treatment, anterior teeth diastemas can also be solved with direct restorations, without increasing the treatment cost, allowing a quick solution for the esthetic inconvenience caused by the presence of atypical interproximal spaces. Depending on some factors such as the number and the size of the diastemas, direct adhesive restorations may represent an excellent treatment option. However, it is important to establish a treatment plan and determine the cause of the diastemas; they are not recommended when there is ample space between the teeth, because it will not offer a natural solution to the patient.[15,16]

In order to have long-lasting restoration, suitable bonding between the adhesive materials and the dental substrate is required. The polymerization reaction for this adhesion process to be successful is affected by residual oxygen release following the dental bleaching process, as a consequence of the bleaching agent and free radicals being in contact with the monomers, hindering the polymerization reaction and clinically interfering with the restorations.[17,18] For this reason, in the present clinical case, the waiting time for diastema closure and esthetic recontouring was 21 days after the end of the bleaching therapy, as this is the recommended time for complete elimination of the remaining oxygen.

CONCLUSION

Among the varied options to accomplish an esthetic improvement in tooth smile, most cases should be multidisciplinarily addressed in order to develop a treatment protocol that attends to the individual characteristics of the patient, as well as their expectations regarding clinical success. The present clinical case demonstrated that the periodontal plastic associated with direct re-anatomization

and tooth bleaching constitutes esthetic and functional rehabilitation of the patient's smile.

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CANDIDA spp. IN LINEAR GINGIVAL ERYTHEMA LESIONS IN HIV- INFECTED CHILDREN: REPORT OF SIX CASES

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Palavras-chave: Crianças. Aids. Manifestações orais. Dentista pediátrico.

RESUMO

Introdução: O eritema gengival linear (LGE), normalmente referido como gengivite do HIV, é a forma mais comum de doença periodontal presente em indivíduos infectados pelo HIV. Recentemente, estas lesões foram consideradas como uma possível forma de candidíase oral eritematosa causada por *Candida. albicans*. Outras espécies, como *C. tropicalis, C. stellatoidea, C. krusei, C. parapsilosis, C. glabrata e C. dubliniensis* também foram identificadas em indivíduos infectados pelo HIV associadas ao LGE. **Objetivo**: O presente artigo mostra a presença de lesões típicas de LGE em seis crianças infectadas pelo HIV e também investigou o agente etiológico das lesões orais através de exames microbiológicos, correlacionando o LGE com as condições sistêmicas dos pacientes. **Case report:** Análises microbiológicas mostraram crescimento positivo para *Candida* spp em todos os pacientes, os quais possuiam imunossupressão grave. Adicionalmente, a regressão total das lesões foi observada após medicação tópica antifúngica. **Conclusão:** A presença de LGE em pacientes pediátricos com AIDS pode ser um marcador preditivo da progressão

Keywords: Children. Aids. Oral Manifestations. Pediatric Dentistry.

ABSTRACT:

Introduction: Linear gingival erythema (LGE), formally referred to as HIV-gingivitis, is the most common form of HIV-associated periodontal disease in HIV-infected individuals These lesions have been recently evaluated as a possible form of erythematous oral candidosis, mainly caused by *Candida albicans*. Other species such as *C. tropicalis, C. stellatoidea, C. krusei, C. parapsilosis, C. glabrata and C. dubliniensis,* have also been identified in some HIV-infected subjects. **Objective:** This case report reveals the presence of typical LGE lesions in six HIV-infected children, and also investigates the etiologic agent through microbiological exams and correlates this oral manifestation with the patients' systemic conditions. **Case report:** Microbiological analyses showed growth for *Candida* spp in all patients; all of whom had severe immunosuppression. However, the regression of lesions was noted after antifungal medication. **Conclusion:** The presence of LGE in pediatric patients with AIDS may be a predictive marker in the progression of AIDS or it may be the first clinical manifestation of HIV infection in children. Hence it is important for dentists to be aware of such lesions.

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INTRODUCTION

Oral candidiasis (OC) is the most common opportunistic infection seen in HIV-infected children[1-4] and it is presented as pseudomembranous and erythematous candidiasis, and angular cheilitis. Linear gingival erythema (LGE), which was formally referred to as HIV-gingivitis, is the most common form of HIV-associated periodontal disease in the HIV-infected population. It is considered to be resistant to conventional plaque-removal therapies, and is known as a lesion of

fungal etiology.[1,5,6] It is characterized by a fiery, linear band, 2 to 3 mm wide, along the marginal gingival accompanied by petechiae-like or diffuse red lesions on the attached gingival and oral mucosa and may be accompanied by bleeding. The prevalence of this lesion varies widely in different studies, ranging from 0 to 48%;[1,2,3,7,8,9] moreover, many of the LGEs may have been misdiagnosed as gingivitis. Mucosal candidiasis is an infection of fungal etiology mainly caused by *Candida albicans,*[1] although other species such as *C. tropicalis, C. stellatoidea, C. krusei, C. parapsilosis, and C. glabrata*[10] have been associated with this infection. Also, *C dubliniensis* has been identified in HIV-infected subjects and two studies[11,12] have demonstrated the presence of this yeast in positive cultures for *C. albicans* in HIV-infected children who had severe immunosuppression. Velegraki et al.[13] presented case reports in which there was strong evidence that linear gingival erythema was of candidal origin. These lesions were clinically evaluated as a possible form of erythematous oral candidiasis. Microbiological exams (direct microscopic examination, culture, biochemical and serological tests) identified *C. albicans* in three pediatric patients and *C. dubliniensis* in one patient. In addition, all lesions healed on antimycotic treatment. The objective of this case report is to describe six cases of HIV-infected children with linear gingival erythema lesions. Also we investigated the etiologic agent and correlated these oral manifestations with the patients' systemic conditions.

CASE REPORT

Six vertically HIV-infected children, who were all patients of a Pediatric AIDS Outpatients Clinic of Universidade Federal do Rio de Janeiro - UFRJ, Rio de Janeiro, Brazil, attended by the staff of The Dental Program for Oral Health, were diagnosed as having oral lesions during routine exams.

All the children had definitive diagnosis for HIV infection confirmed by 2 positive ELISA tests and 1 positive Western Blot. The examinations were performed by a single trained pediatric dentist, after supervised toothbrushing with fluoridated toothpaste, followed by topical fluoride application (2.0 % sodium fluoride). The intraoral exam revealed the presence of a linear gingival erythema and the lesions from all children were resistant to conventional plaque-removal therapy (Figure 1).

The other oral manifestations found in the patients were bilateral submandibular gland enlargement. Patient 1 presented pseudomembranous candidiasis in the jugal mucosa and dorsum of the tongue, while patient 3 presented erythematous candidiasis in the hard palate mucosa.

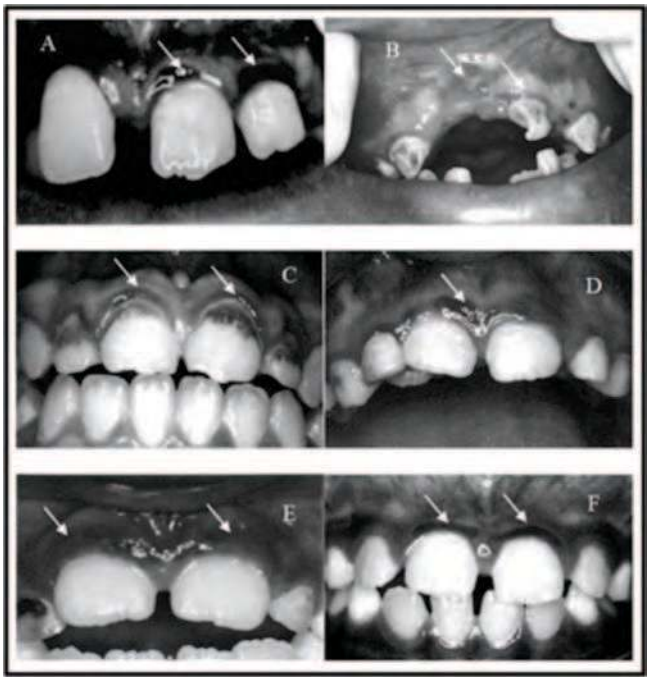


Figure 1: *Clinical aspects of the oral lesions when the clinical specimens were collected for mycological investigation in six HIV-infected children. In all oral lesions a fiery, linear band, 2 to 3 mm wide, along the marginal gingival can be seen (A – patient 1; B – patient 2; C – patient 3; D – patient 4; E – patient 5; F – patient 6).*

All data regarding the patient's personal information, medical history and laboratorial exams (the closest ones to sample collection) such as immunological and clinical classification (CDC classification),[14] percentage of CD4-positive cells and viral load were collected from their medical records (Table 1).

The samples for mycological investigation were obtained by rubbing the lesion (LGE) with a sterilized microbrush on which was then transferred to a test tube. Also they were smeared on CHROMagar Candida? (Becton Dickinson GmbH, Heidelberg, Germany) plates for culture and incubated at 37ºC. This culture medium allows a presumptive identification of common clinical isolates of *Candida* through the production of different colored colonies.[15] Each different colored colony was then identified through biochemical tests of sugar assimilation and fermentation, using the API 20C system (Biomerieux, Marcy L'Etoile, France). Plates with positive growth were classified according to Lamey et al[16] into mild growth (< 10 cfu/ml of saliva), moderate (11-49 cfu/ml) and strong (>50 cfu/ml). The results of the quantification and identification of *Candida* spp. from LGE lesions, as well as the relation with their systemic conditions, can be seen in Table 2.

Table 1: *Patient's medical information and oral examination data*

Patient	CDC Classification	Age (years) / Sex	Race	ELG Localization (buccal or lingual gingiva)	Orofacial lesions	Anti-retroviral therapy
1	C3	12/ F	Caucasian	Anterior maxillary/ mandibular and 16,26 (lingual)	Pseudomembranous candidiasis	Yes
2	C3	7/ M	Caucasian	All teeth, except the 31,41	-	Yes
3	C3	10/ M	Afro- escendent	Anterior maxillary/ mandibular	Erythematous Candidiasis	Yes
4	B2	4/ F	Caucasian	Anterior maxillary teeth (buccal)	-	Yes
5	C2	11/ F	Afro- escendent	21 (buccal)	-	Yes
6	C3	11/ M	Afro- escendent	11,21 (buccal)	-	Yes

Note: N- no symptoms; A- mild symptoms; B-moderate symptoms; C-severe symptoms; 1-absence of immunosuppression; 2- moderate immunosuppression; 3- severe immunosuppression. ***Source:*** 1994 Revised classification system for Human Immunodeficiency Virus infection in children less than 13 years of age (CDC)[14]

Table 2: *Relationship between patients' systemic conditions and the level of* Candida *spp present in the linear gingival erythema lesions*

Patient	Clinical Classification	Viral load	CD4 cells count (%)	Isolates of *Candida*	Growth classification
1	C3	170,000	1.0	C. *albicans*	Mild
2	C3	66,000	3.0	*C. albicans*	Strong
3	C3	110,000	12,0	*C. albicansC. tropicalis*	StrongStrong
4	B3	37,000	18.5	*C. albicans*	Mild
5	C2	280,000	27.0	*C. dubliniensis*	Strong
6	C3	900	35.0	*C. albicans*	Strong

Note: N- no symptoms; A- mild symptoms; B-moderate symptoms; C-severe symptoms (AIDS); 1-absence of immunosuppression; 2- moderate immunosuppression; 3- severe immunosuppression (AIDS). ***Source:*** 1994 Revised classification system for Human Immunodeficiency Virus infection in children less than 13 years of age (CDC)[14]

The mycological investigation demonstrated the presence of *Candida* spp in all LGE lesions. The patients were referred to their clinicians to have the most appropriate antifungal therapy prescribed and they also received oral hygiene and dietary instructions. Those with dental needs were referred to the pediatric dental clinic of the same university. There was a regression of all lesions after the use of topical antifungal treatment [Daktarin® oral gel – Miconazole (Jansen–Cilag Farmacêutica LTDA, São Paulo, Brazil)] for 7 days. Patients were placed under periodical follow up for maintenance of oral health for 8 years. During this time, patients were introduced to antiretroviral HAART therapy and were also followed-up medically.

DISCUSSION

In these six case reports, the fact that all patients presented typical linear gingival erythema lesions, which were resistant to conventional plaque-removal therapies, led to a microbiological investigation. This investigation provided strong evidence that LGE in HIV-infected children may be considered of fungal etiology, since *Candida* spp was isolated from all LGE lesions. These findings corroborate the study of Velegraki et al[13] in which HIV-pediatric patients presented LGE with positive cultures for *Candida* spp.[13] They are also in agreement with the consulted literature which classifies LGE as a lesion of fungal etiology.[1,5,6]

Candida albicans, which was encountered in five of the six patients, was the most frequent species isolated, confirming that this yeast is the main etiologic agent of mucosal candidiasis.[1] One patient presented a mixed culture of *C. albicans* and *C. tropicallis,* confirming the association of other species rather than only *C. albicans* isolates with oral candidiasis.[10] Another patient exhibited positive growth for *Candida dubliniensis* indicating that this species is also present in the pediatric HIV seropositive population.[12,13] Portela et al[17] also demonstrated, the presence of *Candida dubliniensis* in subgingival sites of HIV-positive children, indicating that this species has emerged as another pathogen noted for its *in vitro* potential for azole resistance and its enhanced *in vitro* adherence to human buccal epithelial cells.

The patients' medical history showed that all patients with LGE had AIDS disease, according to the CDC classification,[14] and presented severe clinical signs and symptoms and/or severe immunosuppression. Castro et al[8] studied the correlation between oral manifestations and the clinical/immunological classification of HIV-infected children, which demonstrated that patients who were severely debilitated (high viral load and low CD4 percentage) presented oral lesions such as linear gingival erythema. Similar results were also observed in HIV-seropositive adults, demonstrating a trend for more LGE lesions with lower CD4+ cells.[18]

Other orofacial lesions associated to HIV-infection, such as erythematous and pseudomembranous candidiasis and hairy leukoplakia, are considered markers for immunosuppression and AIDS.[19-21] The present case also revealed that all patients who had LGE presented severe signs and symptoms of immunosuppression, which may suggest that, this lesion might be considered a prognostic indicator of HIV-infection.

The patients were referred to their clinicians, who could prescribe the most appropriate antimycotic treatment, due to the fact that some antifungals may have a cross-reaction with some antiretrovirals. One example is the metabolism process for the elimination of ketoconazole and AZT (zidovudine), which is dependent on the cytochrome-C cellular system, unabling the concomitant prescription of both medications.

In conclusion, all clinicians that treat HIV pediatric patients need to consider that an oral examination is an essential component for early recognition of disease progression, because many oral lesions may occur as one of first clinical signs and symptoms of HIV-infection in patients. The findings in this case report may suggest that the presence of linear gingival erythema lesions should be considered a marker in the progression of HIV-infection in a pediatric population. Thus, further studies should be conducted to evaluate the prognosis of this lesion in HIV-infected children.

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EROSIVE TOOTH WEAR IN AN ASTHMATIC CHILD: A CASE REPORT

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Palavras-chave: Desgaste Erosivo Dentário. Criança. Asma.

Resumo

Introdução: O desgaste dentário erosivo é definido como um processo químico mecânico que resulta em uma perda cumulativa de tecido duro, sem o envolvimento de bactérias. Esse processo pode ocorrer em dentes permanentes e decíduos, podendo atingir o tecido dentinário. Pacientes que relatam doenças crônicas, como alergia respiratória e asma brônquica ou doenças agudas recorrentes como amigdalite, rinite alérgica, sinusite e otite, comumente usam medicamentos por períodos prolongados, portanto, mais atenção deve ser dada ao aspecto odontológico, uma vez que os medicamentos podem causar efeitos indesejáveis. **Objetivo**: Este trabalho tem como objetivo relatar e discutir um caso clínico de um paciente de nove anos, asmático, caucasiano, sexo masculino, que faz uso contínuo de medicamentos anti-asmáticos e desenvolveu o desgate erosivo dentário. **Relato do caso**: De acordo com as necessidades do paciente foi realizado instruções de higiene oral (uso de dentifrício contendo fluoreto estanhoso, fio dental e aplicações tópicas de flúor). Uso diário de enxaguatório bucal contendo 0,05% de fluoreto de sódio também foi recomendado e orientações dietéticas foram realizadas. **Conclusão**: O diagnóstico precoce e preciso das lesões de desgaste erosivo e o reconhecimento dos fatores etiológicos específicos permite o profissional elaborar um programa individualizado de prevenção e controle da progressão do desgaste erosivo dentário.

Keywords: Erosive tooth wear. Child. Asthma.

Abstract

Introduction: Erosive tooth wear (ETW) is defined as a mechanical chemical process that results in a cumulative loss of hard tissue without the involvement of bacteria. This process may occur in permanent and deciduous teeth and may also reach the dentin tissue. Patients who report chronic diseases, such as respiratory allergy and bronchial asthma, or recurrent acute diseases, such as tonsillitis, allergic rhinitis, sinusitis, and otitis, commonly use drugs for prolonged periods; thus, more attention should be given to the dental aspects since the drugs may cause undesirable effects. **Objective**: This paper aims to report and discuss a clinical case of a nine-year-old, male, Caucasian, asthmatic patient who continually uses anti-asthmatic medications and has developed ETW. **Case report**: According to the patient's needs, oral hygiene instructions (use of fluoride stannous dentifrice, dental floss, and topical fluoride applications), daily use of mouthwash solution containing 0.05% sodium fluoride, and dietary guidance were recommended. **Conclusion**: An early and accurate diagnosis of ETW lesions and recognition of specific etiological factors allow the professional to elaborate an individualized prevention and control program for ETW progression.

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INTRODUCTION

Erosive toothwear (ETW) is defined as a chemical-mechanical process that results in the cumulative loss of hard dental tissue without the involvement of bacteria.[1] In addition, ETW can cause dentin sensitivity, loss of vertical dimension, pulp exposure, and aesthetic compromise when anterior teeth are involved.[2] Due to its multifactorial causes, its differential

diagnosis presupposes that, besides physical examination, anamnesis and dietary habits are also considered.[1]

Epidemiological studies have suggested that either the prevalence of ETW is increasing or there is an increased awareness of its occurrence, especially in young adults and adolescents.[3] Currently, ETW is considered a topic of increased interest and concern in daily clinical practice, and its prevalence has varied from 4% to 82% in adults and 10% to 80% in children.[4] Changes in the population's lifestyle, characterized by increased consumption of acidic foods and beverages, are related to the extrinsic factors.[5,6] Some drugs, due to their low pH, represent another important extrinsic etiological factor.[5]

There are systemic diseases that could be part of the risk factors for ETW. Among these, bronchial asthma would make the carrier of the disease more susceptible to the development of erosive lesions.[7] However, this assumption has not yet been confirmed in the literature.[6] The prevalence of asthma in the world population varies from 1% to 20%,[8] and this prevalence is 20% in Brazil.[9] In terms of health issues associated with bronchial asthma, the growing interest in studying this association stems from the fact that asthma is an important global public health problem.[9]

Anti-asthma drugs,[6] such as salbutamol sulfate and ferric supplement,[5,10] and antiallergics, such as brompheniramine maleate (Dimetapp®) and loratadine (Claritin®),[10] have erosive potential. Long-term use of acid medications in the oral cavity of children with chronic disorders causes concern,[10] mainly due to the frequency of ingestion (3 to 4 times a day) and nocturnal use because it is during this period that the protective effects of saliva are reduced. Another problem is the high viscosity of the drug and the side effect of decreasing salivary flow, as these may contribute to the development of ETW.[11] As previous mentioned in the literature, these drugs are effective and have great erosive potential for the teeth, especially when used for the treatment of respiratory diseases, such as antiallergics and bronchodilators, as well as drugs for nutrition and treatment of anemia.[2] Due to this, the pediatric drugs of chronic use were evaluated by some studies regarding the erosive effects of these drugs on deciduous tooth enamel.

Gastroesophageal reflux (GERD) and salivary changes (reduced buffer capacity and salivary flow) are reported as manifestations indirectly associated with bronchial asthma and can be considered risk factors for ETW.[7] Patients with recurrent asthma make prolonged use of medications containing high sucrose concentrations with low pH, and these factors can also lead to ETW.[5] However, little information is known on the association between ETW and bronchial asthma.[6]

Etiological factors should be investigated (intrinsic and extrinsic). Intrinsic factors are an important cause of ETW (among them GERD should be given special attention with referral to a specialist). Extrinsic factors are associated with an acidic diet, when necessary diet advice should be given. All these are associated with dental care (protective dental products, such as topical fluoride, toothpastes, or mouth rinses). In more advanced lesions, restorative procedures should be performed.[1] Therefore, the aim of this case report is to describe the occurrence of ETW of an asthmatic pediatric patient and their respective treatment plan.

CASE REPORT

A nine-year-old Caucasian male visited our pediatric clinic at the Dentistry Faculty, Federal University of Rio Grande do Sul, for routine consultations. Once his mother had noted severe tooth wear, the informed consent was signed, and the guardians allowed the child to be evaluated and treated. During anamnesis, the mother reported the patient had no complaints and that he had used asthma medication since his first months of life. According to the mother's report, the patient had already used the following medications, according to the medical advice and to the crisis period: Aerolin® (salbutamol sulphate), Avamys® (fluticasone furoate), Seretide® (salmeterol xinafoate, fluticasone propionate), Alenia® (formoterol fumarate dihydrate, budesonide), amoxicillin, azithromycin, and prednisolone. In addition, between the ages of 2 and 4 years, the patient made continuous use of Aerolin® spray (salbutamol sulphate) as a preventive method. Nowadays, he uses Avamys® (spray), Seretide® (aerosol inhalation suspension), and prednisolone (tablets). The mother also reported that occasionally the child has heartburn and that she herself does treatment for chronic gastritis.

Regarding the routine of brushing, the mother reported that the patient performs oral hygiene three times a day using fluoride dentifrice without using dental floss. Regarding the diet, a 24-hour reminder interview was conducted, and his mother reported that the patient ingested soft drinks daily after the main meals.

At the clinical examination, a visible plaque index (VPI) of 28.84% and gingival bleeding index (GBI) of 11.95% were recorded. Erosive wear occurred on the palatine faces of the teeth (53, 12, 11, 21, 22, and 63; Figures 1 and 2), occlusal surfaces of the teeth (55, 65, 74, and 75; Figures 1 and 3), incisal teeth (53, 63, 73, and 83; Figure 1), and occlusal surfaces of the teeth (84 and 85; Figure 4). The Basic Erosive Wear Examination (BEWE) index was 3, which indicates hard tissue loss, affecting more than 50% of the surface area.[12] No dentin sensitivity, bruxism, or loss of vertical dimension was detected.

Clinical planning was performed according to the



Figure 1: *Front view, mixed dentition, upper and lower arches.*

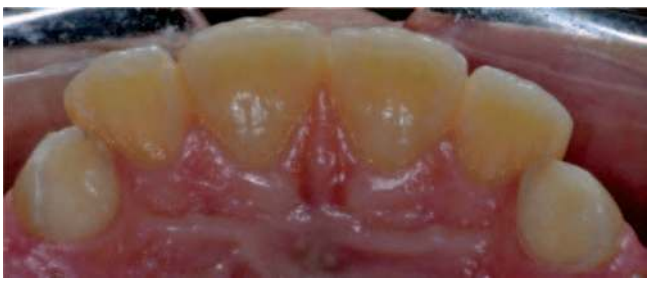


Figure 2: *Erosive tooth wear (BEWE 3) on palatal surface (second sextant).*

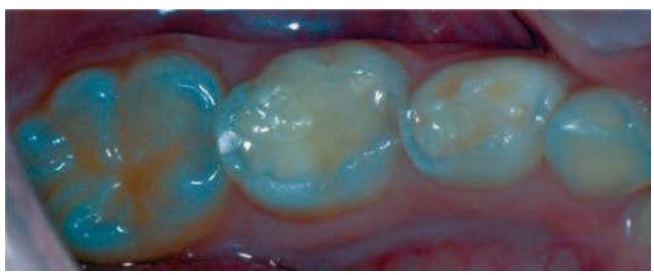


Figure 3: *Erosive wear (BEWE 3) on incisal and occlusal surfaces (third and fourth sextants).*

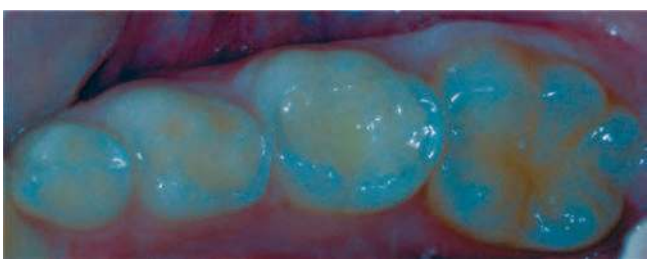


Figure 4: *Erosive wear (BEWE 3) on incisal and occlusal surfaces (fifth and sixth sextants).*

patient's needs and included oral hygiene instructions guiding the use of dentifrice containing stannous fluoride, dental floss, and four topical neutral fluoride applications as well as the daily use of mouthwash solution containing 0.05% sodium fluoride. In addition, dietary guidance was provided (decrease the consumption of soft drinks, avoid the consumption of acidic fruits, and increase water intake). After using asthma medications, the patient was instructed to ingest water and, if possible, chew sugarless gum to increase salivary flow. The patient was referred to a gastroenterologist to investigate the possible association of asthma and ETW with gastric disorders.

DISCUSSION

As described in the case report, the patient is asthmatic. According to the literature, there is a hypothesis that asthmatic patients may present a higher risk of ETW development.[6] For chronic patients, more attention should be paid to dental conditions since the effects caused by medications may be undesirable.[2]

The presence of ETW on the occlusal surfaces (teeth 55, 65, 74, 75, 84, and 85) and on the incisal surfaces (teeth 53, 63, 73, and 83) was verified during the clinical examination using the BEWE index.[12] There is evidence that, due to structural differences, deciduous teeth are more prone to ETW than permanent teeth, as they present a thinner enamel layer, less mineralization, and greater permeability, which could explain the faster progression of ETW in the deciduous dentition.[4]

Considering the type of fluoride compound, NaF, SnF_2, and AmF among others have been studied. There is evidence showing that the use of Sn-containing fluoride seems to provide the best approach for effective prevention of ETW when compared with sodium and amine fluorides.[13] Dentifrices containing stannous fluoride have the potential for reducing the course of ETW.[1] Moreover, Sn-containing fluoride has been suggested because of its mechanism of action, in which metal-rich surface precipitates on the affected enamel.[13] Therefore, stannous fluoride was recommended for the patient.

Extrinsic dietary acids are the cause of a large proportion of ETW.[1] The erosive potential of acidic beverages can include pH and buffering capacity. The greater the buffering capacity of the drink, the longer it will take the saliva to neutralize the acid.[4] The erosive potential of acidic foods and beverages is also related to their physicochemical properties, such as temperature, titratable acidity (total acid level), calcium content, phosphate, type of acid, and fluoride, which alone or combined influence ETW.[14] Phosphoric acid, citric acid, and sodium citrate are commonly found in sports

and soft drinks. Both phosphoric acid and citric acid are triprotic acids that can release up to three hydrogen ions in solution, while phosphate and citrate can sequester calcium ions, though they exhibit erosive potential.[4] When the consumption of fruits and soft drinks is observed at high frequency (one or more times per day), there is a predisposition to develop wear on the palatine surface of the anterior teeth.[1,4] In the present case, ETW may have been potentiated due to the intake of soft drinks.

The professional must recognize the acidic substances responsible for the degradation of the dental structure in the diet of each person and should guide the patient regarding consumption in an intelligent way. This can be implemented by suggesting the reduction of the frequency of consumption or the restriction of consumption to main meals. It is speculated that acidic drink consumption concomitantly with meals would lead to dilution of the erosive effect, reducing damage to the dental substrate.

Regarding the erosive effect of long-term pediatric medicinal products on deciduous enamel, care should be taken to indicate medications to assist in the prevention and treatment of ETW. Oral liquid medicines, sprays, and tablets are usually prescribed for children as the treatment of choice for a short period; for chronic diseases, however, these are consumed daily for very long periods. Some authors argue that certain antiasthmatic drugs have the potential to cause GERD, as they cause relaxation of the smooth muscle, which could affect the lower esophageal sphincter.[6] As this patient presented heartburn, GERD could be also one of the causes of ETW. In relation to the frequency and quantity of the drug use, as in this case, patients that utilize more than one drug have a greater chance of ETW since many children's drugs have low pH values and varying titratable acidity.[15] Powdered versions of the bronchodilator drugs, such as beclomethasone, dipropionate, fluticasone, and terbutaline salmeterol sulfate, have a pH below 5.5 and are more acidic than their aerosolized version; therefore, asthmatic patients who use the powder would be at risk of ETW,[16] as is the case of the patient in the present report using Avamys®, Seretide®, and prednisolone.

The main strategy of prevention and lesion control is to eliminate etiological agents. It is essential to be aware and provide guidance on the causes of ETW. In addition, with the progression of tooth structure loss, pain sensitivity may occur.[2] Therefore, strategies are suggested that provide the following:

- systematic condition treatment,
- reduction of frequency and severity of erosive challenges,
- remineralization and increase of dental surface resistance,
- neutralization of the acids present in the buccal fluid,
- enhancement of salivary defense mechanisms,
- mechanical protection of the dental element, and
- reduction of the influence of other associated wear phenomena.

Other protocols that the dental surgeon should follow are to encourage the following:

- drinking water after using medications and after main meals,
- limiting consumption of acid and sweet substances,
- using sugar-free chewing gum to stimulate salivary flow, and
- using a fluoridated mouthwash daily as prescribed by the dental surgeon.[17]

Related to oral products, there are studies suggesting that some mineral is dissolved from the enamel surface after topical application of acidic oral products with high fluoride content, which would increase the local pH and lead to fluoridated hydroxyapatite reprecipitation. Furthermore, the organic pellicle and the saliva with its buffering capacity lead to an additional protective effect. Highly concentrated weakly acidic fluoride applications are capable of increasing abrasion resistance and decreasing the process of ETW on enamel and dentin.[11]

An early and accurate diagnosis of ETW lesions associated with the recognition of specific etiological factors and the modulating aspects provide support for the professional to elaborate an individualized prevention and control program for ETW progression.

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TISSUE HEALING WITH POLYPROPYLENE MEMBRANE USED AS CONVENTIONAL GUIDED BONE REGENERATION AND EXPOSED TO THE ORAL CAVITY FOR POST-DENTAL EXTRACTION: A CASE REPORT

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Palavras-chave: Cicatrização de Feridas. Regeneração Óssea Guiada. Bone-Heal®. Membrana de Polipropileno.

RESUMO

Introdução: A manutenção do rebordo alveolar após a extração dentária é muito importante para a instalação de um implante osseointegrável e para o resultado estético da reabilitação protética. A cirurgia regenerativa é frequentemente necessária para recuperar o volume perdido quando um dente é extraído. O coágulo sanguíneo que se forma é muito importante na cirurgia regenerativa porque permite que as células mesenquimais se diferenciem em células osteoprogenitoras, o que leva à regeneração óssea. **Objetivo:** Esse relato de caso compara o reparo ósseo após a extração dentária em um mesmo paciente através de três protocolos diferentes em preparação para posterior instalação de implante. **Relato de Caso:** Paciente de 50 anos, sexo feminino, necessitou de extração dentária dos elementos 14, 24 e 26 com posterior reabilitação. A primeira técnica utilizada foi a remoção dentária com sutura somente, a segunda utilizou a membrana de polipropileno BoneHeal de forma exposta após a extração, e a terceira técnica utilizou a membrana BoneHeal de subperiostealmente. Após alguns dias, a membrana subperiosteal expôs e não foi possível continuar em posição. No entanto, as duas regiões que a membrana foi utilizada, obtiveram um maior aumento no tecido mole. **Conclusão:** Em nosso estudo de caso, a membrana de polipropileno pareceu reparar tecido.

Keywords: Wound Healing. Guided Bone Regeneration. Bone-Heal®. Polypropylene Membrane.

ABSTRACT

Introduction: The maintenance of the alveolar ridge after tooth loss is very important for the installation of an osseointegrated dental implant and for the aesthetic result of the rehabilitation prosthesis. Regenerative surgery is often needed to recover the volume lost when a tooth is extracted. The blood clot that forms is very important in regenerative surgery because it allows the mesenchymal cells to differentiate into osteoprogenitor cells, which leads to bone regeneration. **Objective:** This case report compares the bone repair after dental extraction in the same patient via three different protocols and the healing in preparation for posterior implant placement. **Case Report:** A patient 50 year-old female required dental extraction of elements 15, 24 and 26 and prosthetic rehabilitation. The first technique used was tooth extraction and suture only, the second technique used exposedBoneHeal® polypropylene membrane after extraction, and the third technique usedBoneHeal membrane subperiosteally. After a few days, the subperiosteal membrane became exposed and it was not possible to keep it in position. However, the two regions in which the membrane was used obtained a greater increase in soft tissue. **Conclusion:** In our study case, the polypropylene membrane seemed to repair tissue.

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INTRODUCTION

After the removal of a dental element, the alveolar ridge atrophies and loses volume due to intense remodeling and loss of function of the alveolar bone.[1,2] Because of the scientific advances in the field of bone regeneration and in surgical techniques, bone regeneration surgeries in dentistry have been promising and successful.[3,5] Guided Bone Regeneration (GBR) surgery aims to provide bone volume for subsequent rehabilitation with osseointegrated dental implants, as well as to correct bone defects.

Fibroblasts and epithelial cells proliferate faster after tooth extraction, before the dental socket forms bone tissue. GBR aims to isolate and maintain the blood clot that forms in the socket under a membrane, thus avoiding unwanted cells from competing with bone cells in the site to be regenerated subperiosteally, preventing contamination from the unwanted cells, and oral exposure.[6,7]

The spaces that remain after membrane placement in regeneration procedures are filled by a hematoma with characteristics ideal for promoting bone regeneration. Polymorphonuclear cells, the first cells to reach the site, differentiate into macrophages, undifferentiated mesenchymal cells, and fibroblasts. Periosteal, endosteal, and medullary bone molecules form granulation tissue to the postoperative day.[8,9] Mesenchymal cells differentiate into osteoblasts that produce collagen fibers and osteomucin, which eventually give rise to the osteoid. This granulation tissue is gradually replaced by newly formed bone. After 2 weeks, the cellular activity of osteoblasts and osteoclasts replaces the necrotic bone by generating new bone.[10] This cellular activity produces alkaline phosphatase and provides calcium ions in the medium, which are used in the calcification process that forms the new tissue, giving rise to fibrillar bone between the 15th and 20th day of repair.[11] After formation of the fibrillar bone, the second phase of bone resorption and deposition occurs at the site with the formation of a new lamellar osteoid. The formation of the lamellar bone, with well-defined haversian and Volkman's canals, is complete within 120 days. Next, tissue remodeling and functional adaptation of the newly formed bone, which is equivalent to autogenous bone morphologically and histologically, is complete after 180 days.[11]

The region to be regenerated must remain isolated from soft tissue for a sufficient time, allowing the turnover of bone cells to occur. Nonresorbable membranes are considered the gold standard for GBR because they allow this isolation and maintain the stable framework necessary for the bone graft and blood clot[4]. In Brazil, a new polypropylene membrane has been used that improves bone regeneration after a dental extraction by isolating the blood clot formed in the site, not allowing soft tissue cells to migrate into the alveolus to be regenerated, and avoiding competition among cells. This polypropylene barrier is impermeable and nonresorbable and should be placed, intentionally exposed, in the buccal environment for 714 days, according to the manufacturer, using a flapless technique.[1214] This case report compares bone repair after exodontia in the same patient, in which no membrane and BoneHeal® were used at different sites. Three different surgical protocols were used for the bone repair: Protocol 1 was dental extraction and suture only. Protocol 2 was dental extraction and placement of BoneHeal membrane subperiosteally with primary closure of the flap. Protocol 3 was dental extraction and placement of BoneHeal membrane exposed in the oral cavity.

CASE REPORT

Our patient was a 50-year-old female with no systemic disease. Elements 15, 24, and 26 had extensive carious lesions, requiring dental extraction and prosthetic rehabilitation (Figures 1 and 2).



Figure 1: *Preoperative photograph showing teeth 15, 24, and 26 for dental extraction for extensive carious lesions.*



Figure 2: *Initial X-ray showing teeth 15, 24, and 26 in need of extraction.*

Element 15 was selected for Protocol 2: dental extraction and placement of a subperiosteal BoneHeal membrane (INP, São Paulo, Brazil) with greater viability of the flap division and passive closure of the surgical site. The membrane was removed after 4 months of healing because osteogenesis of the dental socket was complete between the third and fourth month post-exodontia. Bone maturation lasted approximately 6 months.[15] Element 24 was selected for Protocol 3: dental extraction with placement of exposed membrane, which was removed after 14 days along with the sutures. Element 26 was selected for Protocol 1: no membrane was used because it had a larger alveolus and interradicular septum than 24, which favored healing without the use of a membrane (Table 1). After the 4-month healing period, the three sites received osseointegrated dental implants.

***Table 1**: Surgery protocols*

Protocol 1	Dental extraction + suture	Element 26
Protocol 2	Dental extraction + subperiosteal BoneHeal	Element 15
Protocol 3	Dental extraction + exposed BoneHeal	Element 24

The surgical procedure started with two buccal relaxing incisions and an intrasulcular incision for element 15, with detachment of a posterior flap to execute the atraumatic dental extraction. After the extraction, the buccal division of the flap began with displacement of the flap to allow passive stabilization next to the palatal mucosa. After the flap was displaced, the membrane was inserted into the adjacent alveolus, between the cortical bone and the periosteum, allowing for the isolation of the clot. After insertion of the membrane with the help of the passive positioning of the flap, a horizontal mattress suture was placed to stabilize the membrane, followed by simple sutures to join the flap next to the palatal mucosa with sutures in the buccal relaxing incisions to close the surgical wound. Dental elements 24 and 26 were removed without major complications. After extraction, a buccal and palatal flap was detached in the region of 24 to allow insertion of the biomembrane between the cortical bone and the periosteum, followed by simple sutures for stabilization. An "X" suture was placed in element 26 for clot retention in the alveolus (Figure 3).

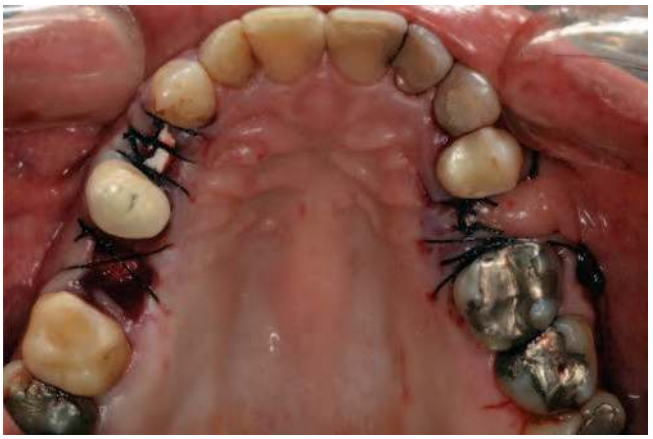


Figure 3: Immediate postoperative photo showing submerged membrane in element 15, exposed membrane in element 24, and only an "X" suture in element 26.

DISCUSSION

Because different surgical protocols were used, the healing stages presented were also different. By postoperative day 4, the subperiosteal membrane used in element 15 (Protocol 2) had become exposed. We chose to keep it in place because its border was not exposed, allowing it to continue as a barrier. At postoperative day 7, the patient returned for revision without the membrane in place. She reported that it fell out the day after the previous consultation when she used dental floss. Therefore, the membrane was in position for only 5 days. We chose not to remove the sutures to allow element 15 to complete 14 days of healing as previously planned. All sutures were removed after postoperative day 14. After removal of the sutures, the Protocol 3 membrane was removed with forceps and without the need for anesthesia. At 21 days of healing, the tissue volume of the Protocol 3 area looked better than that of the Protocol 1 area and was more reddish. The tissue color at the Protocol 1 site was normochromic, indicative of epithelial proliferation at the site. At 69 days, the gingival tissue of Protocol 1 was almost homogeneous. The vestibular and palatine borders in the Protocol 3 area were rosy and not very prominent, whereas in the Protocol 2 area, the vestibular flap was pink and practically in its normal position. During the healing process, it was observed that there was a greater increase in soft tissue in the areas where the membrane was used than in the area where it was not used. Figures 4 and 5 show this increase in soft tissue at elements 15 and 24 compared to that at 26 after 4 months of bone repair. At this time, the bone was evaluated (Figure 6) and the implants were installed at the three sites (STRONG SW implants, S.I.N. Implant System, São Paulo, Brazil, HE 4.1 x 3.75 x 10 mm) and all regions were sutured.



***Figure 4**: After 4 months of healing, the greatest increase in soft tissue occurred at 15 and 24 compared to that at 26.*

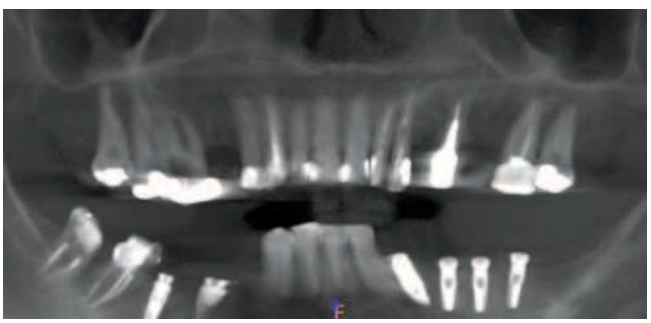


***Figure 5**: X-ray after 4 months of healing, before the placement of implants.*

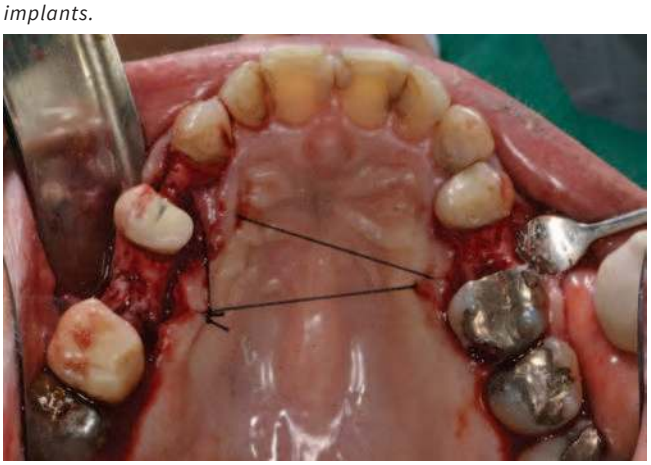


***Figure 6**: Bone overview at the three surgical sites after 4 months of healing.*

The sizes of the dental sockets in the premolar and molar regions were different. The molar area to be repaired was larger than that of the premolar area. However, in this case study, only the increase in soft tissue and the healing in the regions were evaluated for posterior implant installation.

In this case study, the subperiosteal polypropylene membrane provided better soft tissue repair. The retention and isolation of the clot, promoted by the membrane, prevented epithelial cells from migrating into the alveolus, allowing the mesenchymal cells to populate the formed granulation tissue more effectively. Because of the characteristic rigidity of polypropylene and its memory, its conventional use for performing GBR as described in the literature (i.e., submerged) was ineffective in this case because it became exposed in the first days of healing. The exposure of submerged polypropylene membrane used in GBR suggests that the biocompatibility of this barrier may not be satisfactory. Despite the occurrence of this exposure, bone and tissue repair were not impaired during the time the membrane was a barrier.

The technique proposed by the manufacturer of BoneHeal, in which the membrane should remain exposed in the oral cavity, is very simple to perform. It has a low risk of morbidity and does not require a second surgery for removal of the membrane. However, the benefits and the biological events involved in bone repair with this technique are not clear. Therefore, more qualitative and quantitative evaluation studies of the new bone formed using this technique need to be performed. Prospective longitudinal studies for assessing the behavior of hard and soft tissues would be highly relevant.

CONCLUSION

The subperiosteal polypropylene membrane used in our patient seems to have promoted tissue repair. Tissue repair still occurred when the submerged polypropylene membrane applied in GBR became exposed. Histological and tomographic examinations should be performed in future studies to identify the dynamics of bone reparation after these procedures.

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THREE YEAR FOLLOW-UP AND MANAGEMENT OF A SEVERELY DISLOCATED TOOTH AFTER PRIMARY TRAUMA

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Palavras-chave: Traumatismos Dentários. Dente Decíduo. Dente Permanente.

RESUMO

Objetivo: Este relato de caso descreve o manejo e um acompanhamento de 3 anos de um dente anterior incluso e ectópico. **Relato de Caso:** O paciente, uma menina (9 anos de idade) foi encaminhada devido à falta de um incisivo central esquerdo superior permanente. Quando ela tinha 2 anos de idade, sofreu uma intrusão completa de seu incisivo central esquerdo superior decíduo, e o dente re-erupcionou após 4 semanas. O exame radiográfico revelou a impactação e deslocamento grave do incisivo central esquerdo superior permanente. O dente impactado foi cirurgicamente exposto e tracionado ortodonticamente para alinhamento ao longo de um período de 12 meses. **Resultados:** Após este período, o incisivo central apresentou saúde periapical e periodontal satisfatórias, oclusão adequada e bom resultado estético. Após três anos de acompanhamento, arredondamento apical e ausência de dano extensivo às estruturas dentárias ou teciduais foi observado. **Conclusão:** O manejo ortodôntico foi realizado com sucesso, com excelentes resultados funcionais e estéticos. O tratamento de um incisivo impactado é um desafio que deve ser cuidadosamente planejado. Um acompanhamento clínico e radiográfico por um grupo multiprofissional é de extrema importância.

Keywords: Tooth Injury. Primary Tooth. Permanent Tooth.

ABSTRACT

Objective: This case report describes the management and a 3-year follow-up of an unerupted and ectopic positioned anterior tooth. **Case Report:** The patient, a girl (9 years old) was referred due to the lack of a permanent maxillary left central incisor. When she was 2 years old suffered a complete intrusion of her primary maxillary left central incisor, and the tooth re-erupted after 4 weeks. Radiographic examination revealed the impaction and severe dislocation of the permanent maxillary left central incisor. The impacted tooth was surgically exposed and placed in orthodontic traction for alignment over a period of 12 months. **Results:** After this period the central incisor presented satisfactory periapical and periodontal health, adequate occlusion and a good esthetic outcome. After three years of follow-up, apically rounded and no extensive damage to tooth or tissues structures were observed **Conclusion:** The orthodontic management had been successfully performed with excellent functional and esthetic results. Treatment of an impacted incisor is a challenge, which should be carefully planned. A clinical and radiographic follow-up by a multi-professional group is of outmost importance.

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INTRODUCTION

Traumatic injuries occur frequently in primary dentition with a prevalence of between 30-35.5%.[1] The prevalence of intrusive luxation is approximately 29%.[2-4] It is more common in primary dentition, mainly with 1-3 year-old children,[5] when the crowns of the permanent successors are being formed and the alveolar bone is more resilient.[6] Various problems to permanent teeth have been described as a consequence of intrusive luxation of primary teeth such discoloration of enamel, enamel hypoplasia, crown and root dilacerations, and eruption disturbances.[1,3] The magnitude of damage to developing germ is associated to the stage of germ development, intensity, severity, and direction of the impact. [6]

The determination of the relationship of an intruded primary tooth with the follicle of the succedaneous tooth influences in treatment, [1,7,8] If the tooth's apex is displaced labially, waits the spontaneous reeruption, however the extraction is indicated when the apex is displaced toward the permanent tooth germ. [7]

The lack of a maxillary central incisor causes important psychological, functional and aesthetic problems that could have an impact on the child and/or their parents. [9] This paper reports the management and a 3 year follow-up of severe dislocated unerupted anterior teeth as a consequence of intrusive luxation in the primary dentition.

CASE REPORT

A 9 year-old girl was referred to the Pediatric Dental Clinic at the Federal University of Rio de Janeiro, Brazil, for dental treatment due to the lack of the maxillary left central incisor. The mother reported that when the patient was 2 years old she suffered a complete intrusion of her primary maxillary left central incisor. The tooth re-erupted after 4 weeks and her mother did not report any sequelae on the deciduous tooth traumatized.

A clinical evaluation revealed that the patient was in mixed dentition, with lack of the permanent maxillary left central incisor in the arch. This tooth was in a horizontal position at the level of the labial sulcus, but intraosseous (Fig 1a). Lateral and orthopantographic radiographs revealed impaction of the permanent maxillary left central incisor, which was in an ectopic position (Fig 1b and 1c).

The treatment plan was: 1) Recovery of space in the region of the upper left central incisor: fixed brackets

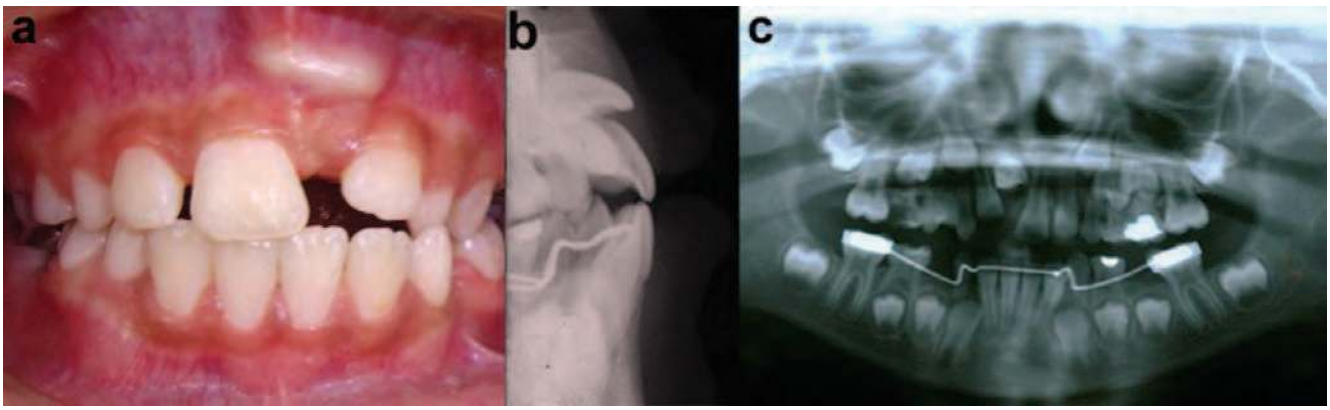


Figure 1: *a) Initial aspect of tooth in a horizontal position at the level of the labial sulcus and lack of space. b) Lateral radiograph: impaction of permanent maxillary left central incisor. c) Orthopantographic radiograph: impaction of permanent maxillary left central incisor (ectopic position).*

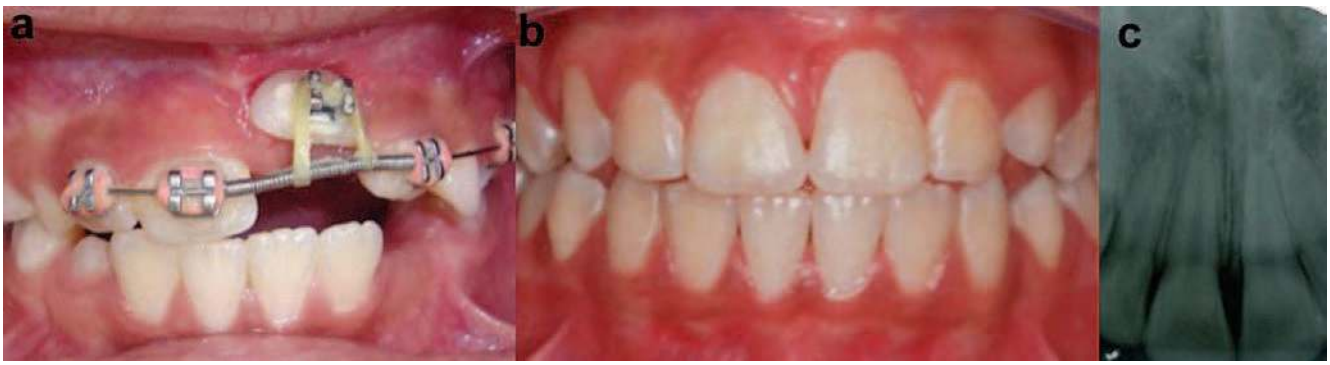


Figure 2: *a) Recover of the space in the region of the upper left central incisor (aspect after 6 months of treatment) and exposure and traction of the tooth. b) Final clinical and c) Radiographic aspect of the case, after 3 years of follow-up.*

(Edgewise Standard; Morelli, Sorocaba, SP, Brazil) was bonded with light-cure orthodontic composite (Transbond TM XT; 3M Unitek/ESPE, Monrovia, CA, USA) on the upper arch, an open spring was placed between the maxillary right central incisor and the maxillary left lateral incisor, the spring was changed weekly to increase the strength of the tooth spacing (Fig 2a). This stage lasted 6 months. 2). After recovering the space in the upper right central incisor region, a surgical exposure of the maxillary left central incisor was performed, and an orthodontic bracket was bonded (Edgewise Standard; Morelli, Sorocaba, SP, Brazil) with light-cure orthodontic composite (Transbond TM XT; 3M Unitek/ESPE, Monrovia, CA, USA). Chlorhexidine mouth rinse was recommended for a 14-day-period as also instructions on oral hygiene. 3) After surgical exposure, the traction and alignment of the tooth was initiated. The traction was made with sequential changes of elastomeric chains (Fig 2a); the alignment and leveling were performed with sequential stainless steel wires. The traction and correct alignment was completed in 12 months.

The child returned for follow-up visits every 6 months. Satisfactory periapical and periodontal health, after three years is shown in Fig 2b, associated with the absence of radicular shortening (Fig 2c) and adequate occlusion demonstrated the success of the case. There was a slight change in the gingival esthetics, and periodontal surgery (gingivoplasty of permanent maxillary left central incisor) was suggested, however the family was satisfied with the final appearance and preferred not to perform it.

DISCUSSION

The problems in permanent teeth are most frequently observed after intrusive injuries of primary teeth.[2-4,6,10] The close anatomical relationship between the primary incisor roots and the permanent successor tooth germs elucidates the effects of intrusive injuries on permanent teeth.[1,4,6] Because of potential sequelae, is important treat the primary teeth traumatized as to avoid any damage in permanent successors.[7,10] The IADT[7] guideline indicate spontaneous repositioning in case of tooth displaced toward or through the labial bone plate and extraction in case of displaced into the developing tooth germ. As the patient reported not receiving any type of treatment after dental trauma, the positioning of the deciduous tooth at the time of the intrusion is not known, the absence of appropriate evaluation and treatment may have contributed to the sequelae of impactation observed in the permanent tooth.

The permanent incisor structure and shape were not changed, but there was a shift in the direction of tooth eruption causing the dental impaction and severe ectopic position of the tooth. Thus, the sequel was limited to an alteration in the eruption pathway.

One of the consequences after traumatic injuries in primary dentition is dilacerations of the crown or root as a result of a developmental anomaly in which the axial inclination of the tooth between the crown and root has been modified.[9] In this case report, the initial aspect of the tooth suggested the appearance of a crown dilaceration, but the evolution of the case showed that it was a case of impaction and the ectopic position of the tooth. The conduct of an impacted ectopic anterior tooth is difficult due its position intraosseous and procedure involves surgical exposition with orthodontic treatment. Other authors [11,12] related the same technique used in this case report.

The impaction of the maxillary incisor is habitually diagnosed at the beginning of the mixed dentition phase, due to the lack of eruption of a tooth. The dental trauma and absence of teeth affects the quality of life of children and their parents, in terms of aesthetic, psychological and functional.[8] Depending on the degree of dental impaction and the position of the tooth, the prognosis may be difficult.[10] The position of ectopic teeth (labial or palatal position) may indicate the need for surgical exposure and orthodontic treatment.[13] A palatal positioned tooth usually arises without intervention.[10,13] It is believed that this impaired eruption is due to the cortical thickness of the palatine bone; as well as to the dense, thick and resistant palatine mucosa; crown and root inclination; and absence of space in the dental arch.[13]

Tooth movements in the arch commonly cause discrepancies of tooth gingival levels.[13] In this case report, it was necessary to regain space before starting the traction of the impacted tooth. Fixed orthodontic therapy was necessary to achieve proper leveling, alignment and angulation. Although, after fixed orthodontic treatment the gingival level of the maxillary left central incisor was different from the level of the neighboring teeth, the child and her family were satisfied with the final appearance and preferred not to perform a periodontal surgery. However, there was an adequate occlusion and an excellent esthetic outcome after the orthodontic treatment.

The patient is currently under revision, and after three years of follow-up, the orthodontic management was successfully performed with the correct alignment of the severely dislocated permanent central incisor. Excellent functional and esthetic results were obtained and the patient and her parents were satisfied with the results. The family preferred not submitted the patient to new procedures, such as gingivoplasty, because they were satisfied with the clinical

outcome. The patient had a low smile line, such that the small gingival defect was not aesthetically perceptible when smiling, which was probably the main factor that contributed to the decision.

CONCLUSION

Traumatic injuries in primary teeth must be treated not only for esthetical and functional reasons, but also because they might have affected the successors' developing germs. Regular follow-up, early treatment and correct clinical interventions after dental trauma may minimize or even prevent damage to the successor tooth. Parents need to be made aware of how important early treatment is.

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MULTIDISCIPLINAR AESTHETIC DENTAL REHABILITATION USING PREFABRICATED COMPOSITE RESIN VENEERS AFTER ORTHODONTIC TREATMENT

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Palavras-chave: Estética Dentária. Diastema. Ortodontia. Gengivectomia.

RESUMO

Introdução: A odontologia cosmética apresenta-se como um dos fatores primordiais no planejamento odontológico, influenciando as pessoas em obter restaurações imperceptíveis e dentes cada vez mais claros. Muitas são as alterações que podem ocasionar problemas estéticos, dentre elas, as discrepâncias entre o tamanho dos dentes e do arco, causando diastemas anteriores múltiplos. Em algumas situações, o tratamento ortodôntico não é suficiente para atender as exigências e expectativas estéticas do paciente que podem necessitar de procedimentos restauradores e periodontais adicionais. As facetas pré-fabricadas de resina composta, são facetas pré polimerizadas de compósito, que surgiram no mercado para simplificar o procedimento restaurador, reduzindo o tempo de trabalho. **Objetivo**: Este artigo teve por objetivo apresentar um caso clínico no qual facetas pré-fabricadas de resina composta foram utilizadas para o tratamento de diastemas para uma reabilitação oral após o tratamento ortodôntico e cirurgia periodontal de forma a alcançar excelência estética. Ele também visa discutir indicações, vantagens e limitações da técnica. **Relato do caso**: O plano de tratamento foi dividido em duas fases. No primeiro, foi realizado um tratamento ortodôntico para alinhar e nivelar os dentes. Isto foi seguido pela cirurgia periodontal, para corrigir a margem gengival. A segunda fase foi a cimentação de facetas compostas diretas, a fim de obter um resultado estético agradável. **Conclusão**: A associação entre os tratamentos foi bem sucedida e provou ser minimamente invasivo, com um mínimo de abrasão dental e preservação das estruturas anatômicas, resultando em melhoria da saúde e satisfação do paciente.

Keywords: Aesthetic Dentistry. Diastema. Orthodontics. Gingivectomy.

ABSTRACT

Introduction: Cosmetic dentistry is one of the primary factors in dental planning, influencing people to obtain imperceptible restorations and increasingly clear teeth. Several disorders, such as discrepancies between the teeth size and the arch size, which cause multiple anterior diastemas, can generate aesthetic issues. In some situations, orthodontic treatment is not sufficient to meet the patient's aesthetic expectations, which may require additional restorative and periodontal procedures. The prefabricated facets of composite resin are prepolymerized composite facets that have appeared on the market to simplify the restorative procedure, reducing working time. **Objective**: This paper aims to present a clinical case in which prefabricated composite resin veneers were used to treat diastemas for oral rehabilitation after orthodontic treatment and periodontal surgery in order to achieve aesthetic excellence. It also aimed to discuss indications, advantages, and limitations of the technique. **Case report**: The treatment plan was divided into two phases. In the first one, an orthodontic treatment was performed to aligned and leveled the teeth. This was followed by the periodontal surgery, to correct the gingival margin. The second phase was the cementation of costumized direct composite veneers, in order to achieve an esthetical pleasing result. **Conclusion**: The association of treatments was successful and proved to be a minimally invasive, with minimum dental abrasion and preservation of anatomic structures, resulting improved patient health and satisfaction.

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INTRODUCTION

An ideal smile is associated with buccal health, facial harmony, and synergy between form and function. One of the biggest issues in daily clinical practice is the discrepancy between the dimensions of teeth and arch. However, its correction represents a challenge for professionals due to the extreme range of treatments available.[1]

Orthodontic treatments allow for the repositioning of teeth to achieve harmony with the adjacent teeth, arch and facial form, in order to create a proper environment for gingival health and for a stable and functional occlusion.[2] Cases involving excessive space, discrepancies between the teeth and arch sizes, and changes in color or shape may require additional restoration and periodontal procedures.[3] Therefore, a multidisciplinary collaboration between professionals in the fields of orthodontics, restorative dentistry, and periodontics results in an improved application of their competences for a successful treatment for the patient.[4]

The progress in adhesives for dental hard tissues and the advances in dental ceramics have enabled conservative and long-lasting treatments,[5] since dental ceramics represent one of the most stable materials available. They also offer improved aesthetics due to their ability to reproduce the color, texture, and translucency of natural dental enamel. However, some mechanical limitations, such as their fragility, low fracture toughness, the requirement of a laboratorial phase, and the high cost, may discourage patients and dental professionals from choosing them.[6]

The prefabricated composite resin veneer system is likely to be established as a modern version of direct composite resin restorations and may eventually replace the use of ceramic veneers. The creation of extremely aesthetic and thin lenses, combined with higher pressure and temperature, followed by laser surface vitrification, resulted in improved physical properties of prefabricated composite resin veneers. Thus, they have become an excellent treatment option and a possible alternative to ceramic veneers for the treatment of multiple diastemas.[6]

Therefore, this paper presents a clinical case in which prefabricated composite resin veneers were used to treat diastemas for oral rehabilitation after orthodontic treatment and periodontal surgery in order to achieve aesthetic excellence. It also discusses indications, advantages, and limitations of the technique.



Figure 1: *Initial view after placing braces with lips pulled back.*

CASE REPORT

A 54-year-old woman came to the School of Dentistry, Federal University of Rio de Janeiro, complaining specifically about the aesthetics of her smile and difficulties in speech.

The aesthetic analysis conducted during the clinical examination revealed disharmonic appearance of her smile and the presence of multiple diastemas in the superior and inferior arches, mismatches between teeth, and inconsistent shapes and sizes. The treatment plan for this patient was divided into two phases. In the first phase, an orthodontic treatment was performed with Roth bracket prescription, slot 0.22, and bonding of tooth 15 to 25 **(Figure 1).** During this phase, teeth were aligned and leveled, and their rotations, inclinations, and angulations were corrected in order to reduce vertical and horizontal discrepancies. Due to the discrepancy between bone bases and teeth, the residual spaces remained significant at the end of treatment. Consequently, the spaces were divided in such a way that the teeth were placed in a position that was more harmonic and favorable for occlusion with prefabricated composite resin veneers. For the second phase of treatment, it was decided to use Brilliant TMNG Componeer® prefabricated composite resin veneers (ColteneVigodent SA, Indústria e Comércio, Rio de Janeiro, Brazil) for teeth 14,13,12,11, 21, 22, 23, and 24.

Teeth were measured in order to provide better aesthetic proportions between dental width and height as per the concepts of the Golden Ratio by mapping the necessary changes. Because they were small and presented large spacing, larger veneers (transparent 11L and 21L) were selected. For the other teeth, corresponding veneers were selected (transparent 14L, 13L, 12L, 22L, 23L and 24L).

At the end of the orthodontic treatment, it was observed that the zeniths of teeth 21, 22, and 23 were not aligned with the parallel teeth on the right side. For this reason, a gingivoplasty was performed to re-stablish an aesthetic gingival line **(Figure 2A).** Under local infiltration anesthesia, the bleeding points were determined with an exploratory probe. This was followed by the connection of these points



***Figure 2A**: Approximate view of the upper arch immediately after gingivoplasty of teeth 21, 22, and 23.*
***Figure 2B:** Approximate picture after the orthodontic treatment showing teeth in more harmonic and favorable positions for completion with prefabricated composite resin veneers.*

with a 15c slide using the internal bezel technique and subsequent removal of the gingival collar; 1mm of teeth 21, 22, and 23 were removed, and the length of clinical crowns and the height of the gingival margin were determined. After the area healed, the brace were removed **(Figure 2B).**

Preparation for the veneers was essentially only the abrasion of the more prominent edges on the vestibular surface of teeth for a better setting of the veneers. After relative isolation, the veneers were customized and tested. To cement the parts, the internal surfaces of the veneers and teeth were treated phosphoric acid before the application of adhesive system.



***Figure 3**: Cemented veneers of all teeth.*

The application of the veneers began with teeth 11 and 21. The Brilliant TMNG Componeer® composite resin (enamel A2) was spread on the internal surface of the veneers, which were then positioned and gently pressed. The restorations



***Figure 4:** Final view after cementation of veneers.*

were aligned according to the facial median line and checked for symmetry. The most critical excesses were removed with an exploratory probe and, finally, photoactivation was performed for 40 seconds. Next, the other veneers were also cemented in pairs **(Figure 3).**

Prior to the finishing and polishing stage, phonetic tests were carried out to observe the lip seal. Next, all interferences were diagnosed, occlusal adjustments were made, and measurements were taken. Finishing and polishing were performed using abrasive erasers. The final aspects of the case can be observed in **Figure 4.**

A residual diastema of 0.5 mm could be observed and its maintenance was necessary to preserve the proportionality between the teeth. In this way the central incisors did not get bigger, generating a disharmony of the smile.

DISCUSSION

Apart from functional and phonetic impairments, the changes in color, structural forms, and position caused by developmental pathologies or iatrogenic factors can result in important aesthetic issues for patients.[1] Diastemas have been defined as spaces larger than 0.5mm between the nearest surfaces of adjacent teeth and are a common clinical problem. As observed in the case presented, the patient exhibited generalized diastemas in the upper and lower front teeth, which caused enormous psychological and social discomfort.

In treatments requiring a multidisciplinary approach, communication between specialties is essential for achieving better aesthetic results, particularly in the anterior region of the maxilla. Combined treatments based on a correct diagnosis and an adequate treatment decision aid in the planning of a sequence of therapeutic procedures and constitute the best way to respond to these cases.[7] When these efforts are combined, the functional and aesthetic results are greatly reinforced.[8] Thus, a multidisciplinary treatment related to the one presented in this case is essential for immediate and long-lasting success.

In the present case, the orthodontic treatment enabled pre-restoration alignment, which allowed for both a better aesthetic approach during the subsequent restoration and harmonic teeth repositioning in relation to the adjacent teeth, the arch and the face, thus creating stable and functional occlusion. Next, periodontal surgery restored the aesthetic gum line by repositioning the zeniths and the gingival contour. After the teeth were repositioned and the gingival contour was corrected, the aesthetic of the upper teeth was successfully restored through restoration techniques, with minimal preparation and with the preservation of dental structure in such a way that pulp damage was avoided. These outcomes were achieved with minimal gingival trauma around the restored teeth.[8]

Direct composite resin veneers and laminated composite or ceramic veneers can be used for non-invasive or minimally invasive esthetic treatments.[9,10] The advances of adhesive technologies have made a variety of restorations possible through the use of more conservative techniques. When the color of the substrate is acceptable, very thin veneers (0.3-0.7 mm) can be used.[5] The reasons to choose prefabricated composite resin veneers in the case presented were that this treatment is minimally invasive, fast, and low cost, and also provides substantial aesthetic benefits. They are also extremely thin, pre-shaped, available in different sizes and prepared with pre-polarized hybrid composite resin of high durability.[6] They can be repaired, adjusted and cemented onto the tooth using direct hybrid composite resin. These materials are available in different colors and opacities to match enamel translucency and can therefore closely mimic the appearance of a natural tooth.[11]

A residual diastema can be observed in the result of the treatment presented. This was necessary to maintain the aspect heigth X width of the veneers, and in this way preserve the harmony between the elements. However, this technique does not replace conventional customized ceramic veneers, but it is an alternative that is available to clinicians. It has the advantage of being finalized in only one session without the need for impressions or lab work. In addition, restorations can be personalized (color and shape) through the use of cosmetic contours and reconstruction through the addition of more composite resin and/or dental drilling, as in the case presented, in order to achieve an esthetically pleasing result.[11]

CONCLUSION

The combination of orthodontic treatment, periodontal surgery and the use of prefabricated composite veneers constitute an excellent option for treating teeth with multiple diastemas and resolved the patient's issues in a minimally invasive and easy way. In addition, repairs can be made at any time during or after their application. There are limitations to their use, but with good planning and correct indication, the case can be resolved successfully.

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BULK-FILL RESINS IN PEDIATRIC DENTISTRY: CASE REPORTS WITH SIX-MONTH FOLLOW-UP

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Palavras-chave: Odontopediatria. Primeiro molar permanente. Resina *bulk-fill*.

RESUMO

Introdução: A evolução dos procedimentos operatórios minimamente invasivos possibilitou a recuperação da função e estética com praticidade, proporcionando tratamentos de excelência. Resinas *bulk-fill* apresentam vantagens: inserção em incrementos únicos de até quatro milímetros, menor contração de polimerização e redução do tempo clínico, mantendo propriedades estéticas semelhantes às resinas compostas convencionais. **Objetivo**: Relatar dois casos clínicos de restaurações classe I em lesão cariosa em dentina não cavitada (ICDAS 4), em molares permanentes, com resina *bulk-fill* utilizando a técnica da réplica oclusal. Adicionalmente, foi realizado o acompanhamento dos casos após seis meses, avaliando-se de acordo com os critérios *World Dental Federation* (FDI) e *Public Health Service* (USPHS). **Relato**: As restaurações foram realizadas utilizando-se os materiais: Caso 1: resina Filtek *bulk-fill flow* (3M ESPE) associada à resina de cobertura Filtek Z350 XT (3M ESPE); Caso 2: resina Filtek *bulk-fill* condensável (3M ESPE). Avaliações foram conduzidas por três avaliadores cegos em relação aos materiais e técnicas. **Resultados**: Caso 1 apresentou menores pontuações nos critérios FDI e USPHS, com melhores propriedades estéticas, funcionais e biológicas, comparado ao Caso 2. **Conclusão**: Ambos os tratamentos apresentaram resultados clínicos satisfatórios após 6 meses de avaliação. Resinas *bulk-fill* possibilitam um tratamento rápido, eficaz e de qualidade.

Keywords: Pediatric dentistry. First permanent molar. Bulk-fill resin.

ABSTRACT

Introduction: Minimally invasive dental procedures are aimed at recovering function and aesthetics in a practical manner, providing excellent treatment options. Bulk-fill composites offer some benefits, such as placement in single increments up to 4-mm thickness, decreased polymerization shrinkage, and general reduction in clinical time, while keeping aesthetic properties similar to those of conventional composite resins. **Objective:** To report two clinical cases of class I restorations in permanent molars with dentin carious lesions (ICDAS 4) treated with bulk-fill composites using the occlusal stamp technique. Cases were followed up for 6 months and the restorations were evaluated according to the World Dental Federation (FDI) and Public Health Service (USPHS) criteria. **Case report:** Restorations were performed using the following materials: Case 1 - Filtek™ bulk-fill flowable resin (3M ESPE) associated with Filtek Z350 XT resin (3M ESPE); Case 2 - Filtek bulk-fill packable resin (3M ESPE). Three blinded evaluators assessed the materials and techniques in the follow-up period. **Results:** Case 1 achieved the lowest scores by the FDI and USPHS criteria, presenting better aesthetic, functional, and biological properties. **Conclusion:** Both treatments were clinically satisfactory after 6 months. Bulk-fill composites are good materials, allowing for a fast, effective, and quality treatment for the pediatric patient.

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INTRODUCTION

Among all dental surgical procedures, composite restorations are one of the most frequent ones in daily clinical practice.[1] Composite resins are widely used for restorations of posterior permanent teeth because of their inherent properties, such as aesthetics similar to the tooth structure, translucency, wear characteristics, and biocompatibility.[2]

In order to simplify and speed up dental procedures, recently developed bulk-fill composites can be applied in large increments of up to 4-mm thickness[1,3] at one time. The main difference between bulk-fill and conventional composite resins is in the low polymerization shrinkage of the former but, in spite of that, aesthetics and function are not compromised.

The reduction in composite increments is closely associated with a shorter clinical chair time and with fewer manipulation errors.[3] The overall decrease in the patient's treatment time obtained with these composites makes them a great alternative in pediatric dentistry, as quicker clinical procedures are essential when dealing with young patients.

The aim of this study was to report two cases of class I restorations performed with bulk-fill composites in non-cavitated dentin carious lesions using the occlusal stamp technique. In addition, longitudinal follow-up of the restorations was performed after 6 months according to the World Dental Federation (FDI)[4] and the Public Health Service (USPHS) criteria.[5] These case reports are described in compliance with the Case Report Guidelines (CARE).[6]

CASE REPORTS

CASE 1: BULK-FILL FLOWABLE RESIN

A 13-year-old female patient was brought in by her mother to the Pediatric Dental Clinic of the Federal University of Rio de Janeiro for a dental checkup, without any specific dental complaints. There was no report of any relevant systemic conditions in the patient's medical history taking. The informed consent form was signed by the patient's mother.

During dental examination, a dark shade in the underlying dentin was noted on the occlusal surface of the right mandibular first permanent molar (46) (Figure 1A). This lesion was classified as ICDAS 4 according to the International Caries Detection and Assessment System (ICDAS)[7,8] (Figure 1B).

For a more accurate diagnosis, transillumination (Figure 1C) and interproximal radiographs (Figure 1D) were performed. As the occlusal surface was intact, the use of the occlusal stamp technique was planned with bulk-fill flowable composite (3M ESPE, Campinas, Brazil) and a cover layer of Filtek™ Z350 XT (3M ESPE, Campinas, Brazil) as restorative materials.

Initially, the stamp was fabricated using a self-curing acrylic resin. Powder was added to the liquid, petroleum jelly was spread over the occlusal surface (Figure 2A), and the resin was adapted to the tooth to fabricate the occlusal stamp (Figure 2B).

After anesthesia and rubber dam isolation, the overlying enamel was removed with a high-speed spherical drill (1012-KG Sorensen, São Paulo, Brazil) (Figure 2C). Selective removal of dentin carious tissue was then performed with a low-speed spherical bur (#2 FG, Microdont, São Paulo, Brazil) and with a manual excavator (Figure 2D). Selective etching was performed with 37% phosphoric acid for 15 seconds in enamel and, after that, acid was also applied to the dentin for another 15 seconds (Figure 2E). After washing and drying, Adper Single Bond Universal adhesive (3M ESPE, Campinas, Brazil) was applied in the prepared cavity and cured for 20 seconds.

Cavity depth was checked with a calibrated probe (with millimeter markings), since the use of a bulk-fill flowable composite as restorative material requires that each increment should not exceed 4 mm (Figure 2F). The composite was dispensed in a single 4-mm increment with the disposable tip into the cavity and cured for 40 seconds (Figure 2G). Subsequently, the nanoparticulate Filtek Z350 XT composite (3M ESPE, Campinas, Brazil) was placed over the flowable increment (Figure 2H) and the occlusal stamp was positioned over the latter composite layer, followed by a final light curing (Figure 2I).

After removing the occlusal stamp, the appearance of the restoration was immediately assessed (Figure 2J). Rubber dam isolation was then removed and the occlusal contact points were checked. Polishing was then performed (Figure 2K) and the patient returned for follow-up after 6 months (Figure 2L).

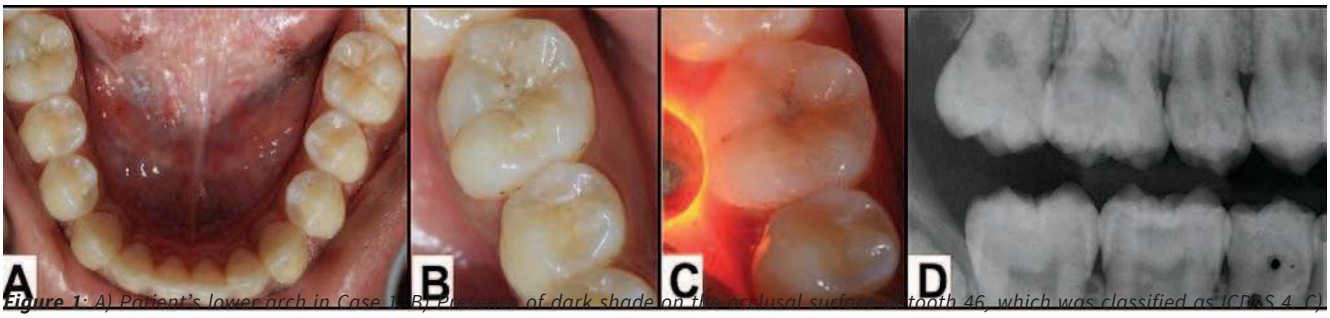


***Figure 1**: A) Patient's lower arch in Case 1. B) Presence of dark shade on the occlusal surface of tooth 46, which was classified as ICDAS 4. C) Transillumination of tooth 46, confirming dentin involvement in the carious lesion. D) Bitewing radiography of the region, evidencing carious lesion in tooth 46.*

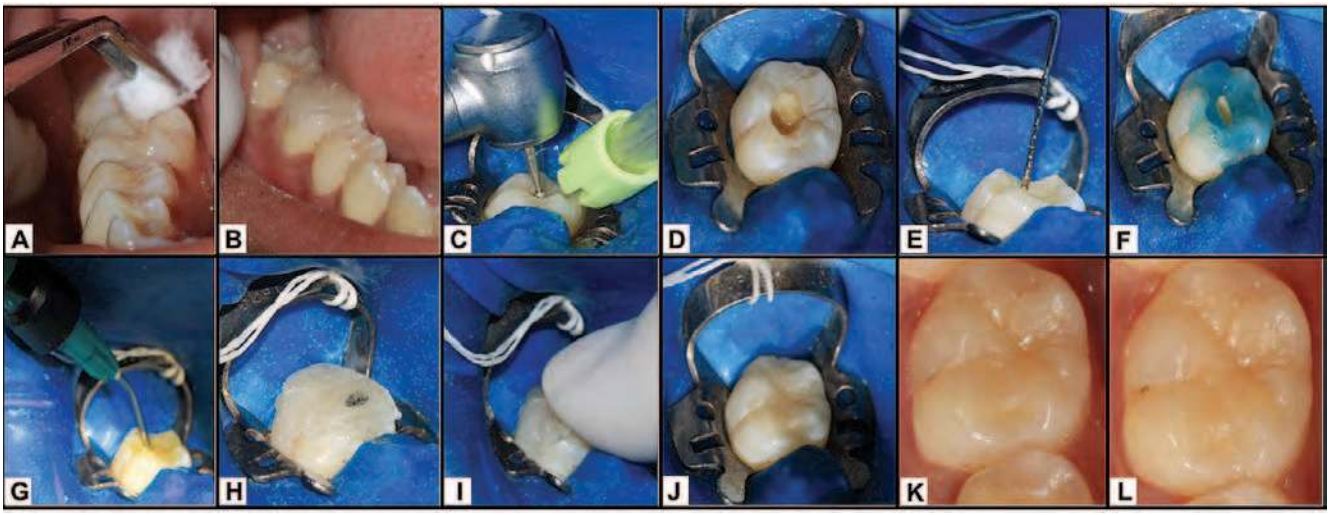


***Figure 2**: Case 1. A) Petroleum jelly application on the tooth. B) Acrylic resin placed on tooth 46 to produce the stamp. C) After rubber dam isolation, caries removal was initiated. D) Tooth 46 after caries removal. E) Measurement of cavity depth with a millimeter probe. F) Selective enamel etching procedures. Adhesive was then applied and cured. G) Placement of bulk-fill flowable composite. H) After curing, a nanoparticulate composite resin was applied as a cover layer and stamp was placed immediately thereafter. I) Digital pressure was applied. Photopolymerization was performed over the placed stamp J). Immediate final aspect. K) Clinical aspect after polishing. L) Clinical follow-up after 6 months.*

CASE 2: BULK-FILL PACKABLE RESIN

An 11-year-old male patient was brought in by his mother to the Pediatric Dental Clinic of the Federal University of Rio de Janeiro for routine examinations. Before the evaluation, the informed consent form was signed by the patient's mother. No relevant systemic alterations were noted during history taking. Dental examination revealed stained pits and fissures in the mandibular first permanent molars (Figure 3A and 3B). Interproximal radiographs were taken (Figure 3C) and the presence of a dentin carious lesion under the "intact" occlusal fissure was observed in the left mandibular first permanent molar (36). As the patient presented negative (-) behavior towards dental treatment, the stamp technique was chosen as restorative option, aiming for quality and efficiency, using bulk-fill packable resin (Filtek™ Bulk Fill - 3M ESPE, Campinas, Brazil).

The occlusal stamp was fabricated as previously described (Figure 4A and 4B), followed by anesthesia and rubber dam isolation of the tooth (Figure 4C). High- and low-speed spherical drills and manual excavators were used for selective removal of the carious tissue (Figure 4D). The cavity was measured with a calibrated probe (with millimeter markings) at a depth of less than 5 mm (Figure 4E). Acid etching was performed with 37% phosphoric acid as described in Case 1 and Adper Single Bond Universal adhesive (3M ESPE, Campinas, Brazil) was applied in the cavity and light-cured for 20 seconds (Figure 4F). The Bulk-Fill Packable composite (3M ESPE, Campinas, Brazil) was then placed in a single increment into the cavity (Figure 4G) and the occlusal stamp was pressed over the composite (Figure 4H). Light curing was performed for 40 seconds (Figure 4I) and the stamp was removed, revealing the appearance of the final restoration (Figure 4J). The rubber dam was removed and the occlusion was checked with carbon paper (Figure 4K). The restoration was polished and the patient returned for follow-up after 6 months (Figure 4L).

FOLLOW-UP AFTER 6 MONTHS

Two criteria were used to assess the quality of dental restorations during the follow-up visits: 1) the modified Public Health Service (USPHS) criteria,[5] which analyze anatomical shape, marginal adaptation, color, marginal discoloration, surface roughness, and caries presence; 2) the World Dental Federation (FDI) criterion,[4] which analyzes aesthetic (surface brightness, color, and anatomical shape), functional (retention and fracture of the material, adaptation, marginal contour, and wear), and biological properties (dental integrity, periodontium, adjacent mucosa, and general oral health).

Three experienced pediatric dentists blinded to the materials and techniques used on each patient conducted the longitudinal evaluations. All clinical examinations were performed in the dental setting, under ideal lighting, with the aid of a dental mirror and explorer.

Patient 1, treated with Filtek™ Bulk-Fill Flowable (3M ESPE) with a cover layer of Filtek Z350 XT (3M ESPE), had lower USPHS (Table 1) and FDI scores (Table 2) than Patient 2, treated with Filtek™ Bulk-Fill (3M ESPE) (Tables 3 and 4). The combination of Bulk-Fill Flow and Filtek Z350 XT resulted in better aesthetic, functional, and biological properties.



***Figure 3**: Case 2. A) Patient's upper arch. B) Patient's lower arch. C) Left-side interproximal radiograph showing a non-cavitated dentin carious lesion in tooth 36.*

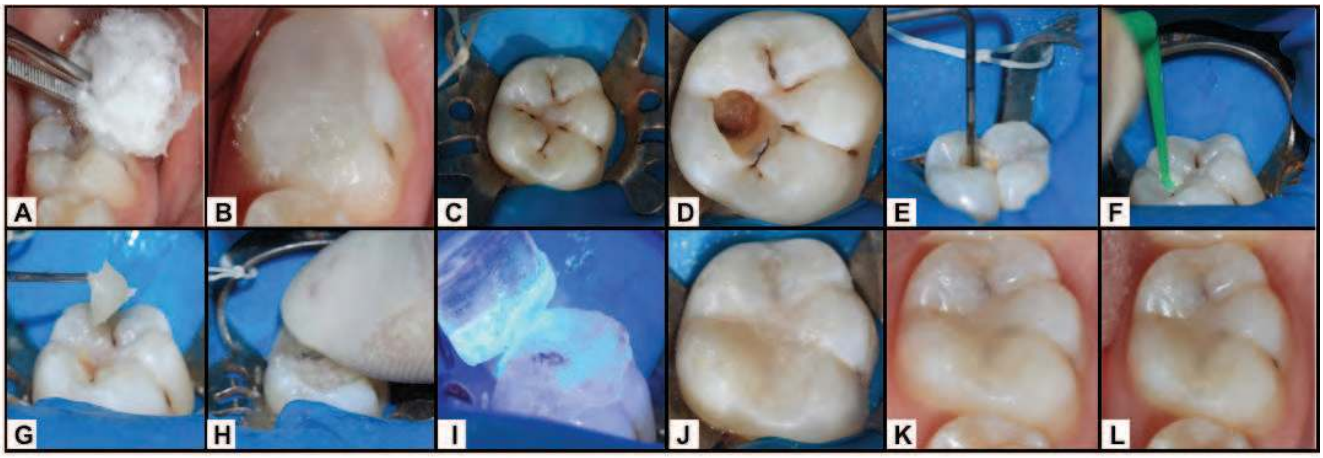


***Figure 4**: Case 2. A) Petroleum jelly application on tooth 36. B) Fabrication of the stamp in acrylic resin. C) Tooth after rubber dam isolation. D) Occlusal aspect after caries removal. E) Measurement of cavity depth with a millimeter probe. F) Application of bonding agent after acid etching, washing, and drying. G) After adhesive curing, placement of the bulk-fill packable resin; H) placement of the occlusal stamp and digital pressure; I) Photopolymerization. J) Immediate final appearance. K) Clinical aspect after polishing. L) Clinical follow-up after 6 months.*

***Table 1**: Evaluation of patient 1 (restoration with bulk-fill flowable resin) after 6 months, according to the modified Public Health Service (USPHS) criteria.*

Criterion	Examiner 1	Examiner 2	Examiner 3
Anatomic shape	0	0	0
Marginal adaptation	0	0	1
Color	0	0	0
Marginal discoloration	0	0	0
Surface roughness	0	1	1
Caries presence	0	0	0

***Table 2**: Evaluation of patient 2 (restoration with bulk-fill packable resin) after 6 months, according to the modified Public Health Service (USPHS) criteria.*

Criterion	Examiner 1	Examiner 2	Examiner 3
Anatomic shape	0	0	0
Marginal adaptation	0	0	1
Color	1	0	0
Marginal discoloration	0	1	0
Surface roughness	0	0	1
Caries presence	0	0	0

DISCUSSION

With the improvement of restorative dental materials, it is now possible to combine function, aesthetics, and practicality into minimally invasive treatments. As restorative dental materials evolve, changes in the polymer matrix seek to reduce the polymerization shrinkage stress.[9] Improvement in bulk-fill resins allows a great depth of cure as well as a low polymerization shrinkage.[10] This occurs because of the incorporation of more reactive photoinitiators, which act as polymerization reaction modulators.[10] In fact, the bulk-fill restorative composite allows the placement of large increments with good aesthetic results,[2] keeping the functions of a conventional composite resin. Both tested materials yielded acceptable results, with easy handling, restoring aesthetics and function with less in-office time, which is fundamental in pediatric dentistry.[11]

Although the incremental technique with layers of up to 2 mm is the conventional method of composite resin restoration, there is no consensus in the literature regarding

the benefits of this procedure for the final quality of the restoration.[12] With the reduction in the number of clinical steps, technical simplification, and possibility of placement of up to 4-mm layers, bulk-fill composites have been strongly recommended,[13] especially for posterior teeth.[14] Although the introduction of bulk-fill composites has sparked off an intense debate, restoration of the entire cavity in a single placement procedure is not recent in the scientific literature.[3]

Commercially available bulk-fill composites come in flowable (used as a base material and associated with a cover layer of conventional resin) and paste or packable (for restoration in one single increment) forms.[13] In this study, the bulk-fill flowable and packable composites were from the same manufacturer and were placed with the same technique. However, treatment outcomes were different. As the follow-up evaluation was performed blindly, results can be considered consistent and reliable. In this case, patient 1 had lower scores both in modified USPHS and FDI criteria.

A clinical study on the clinical performance of class II restorations in bulk-fill and conventional composites found that bulk-fill restorations resulted in less marginal discoloration and misadaptation.[14] The present follow-up evaluation, however, showed differences between materials for marginal discoloration according to the USPHS criteria, with bulk-fill packable resin presenting a slight color change (which, according to one of the evaluators, could be polished). This probably occurred because nanoparticulate coating was used in Case 1, which is indeed indicated for aesthetic procedures, allowing adequate finishing and polishing. On the other hand, in Case 2, only the bulk-fill packable composite was used, resulting in differences in aesthetic and functional properties. On the other hand, a clinical study comparing high-viscosity bulk-fill resins and nanohybrid composite resins showed great performance of both materials.[15] This could demonstrate that both dental materials can be clinically effective despite the differences found in the present case report. Finishing and polishing procedures are essential for obtaining better aesthetic outcomes and increasing the longevity of direct composite restorations,[16] reducing roughness and making the tooth surface smoother and glossier. Magdy et al.[16] observed that bulk-fill and nanohybrid composites presented smoother surfaces after finishing and polishing compared to nanoceramic composites. By evaluating the different types of polishing systems, Rigo et al.[17] demonstrated that surface roughness is mostly related to the material composition than to the used polishing system.[17] Thus, despite the slight difference in the results of the present study, the aesthetic properties of the bulk-fill packable composite can be improved with finishing and polishing, since the success of restorations does not depend exclusively on their mechanical properties, but also on aesthetic satisfaction.[18]

Table 3: *Evaluation of patient 1(restoration with bulk-fill flowable resin), according to FDI World Dental Federation criteria (HICKEL et al, 2010).*

	Examiner 1	Examiner 2	Examiner 3
Surface brightness	Good	Very Good	Very Good
Color – surface and marginal	Very Good	Very Good	Very Good
Color and translucency	Very Good	Very Good	Good
Anatomic shape	Very Good	Very Good	Good
Material fracture and retention	Very Good	Very Good	Very Good
Marginal adaptation	Very Good	Very Good	Very Good
Occlusal contour and wear	Very Good	Very Good	Very Good
Proximal anatomic shape	Very Good	Very Good	Very Good
Radiographic assessment	Very Good	Very Good	Very Good
Patient satisfaction	Very Good	Very Good	Very Good
Postoperative sensitivity and dental vitality	Very Good	Very Good	Very Good
Secondary caries, erosion, abfraction	Very Good	Very Good	Very Good
Dental integrity	Very Good	Very Good	Very Good
Periodontal response	Very Good	Very Good	Very Good
Adjacent mucosa	Very Good	Very Good	Very Good
Oral and general health	Very Good	Very Good	Very Good

***Table 4**: Evaluation of patient 1(restoration with bulk-fill flowable resin), according to FDI World Dental Federation criteria (HICKEL et al, 2010).*

	Examiner 1	Examiner 2	Examiner 3
Surface brightness	Satisfactory	Satisfactory	Satisfactory
Color – surface and marginal	Very Good	Good	Good
Color and translucency	Good	Very Good	Very Good
Anatomic shape	Very Good	Very Good	Very Good
Material fracture and retention	Very Good	Good	Good
Marginal adaptation	Very Good	Very Good	Very Good
Occlusal contour and wear	Very Good	Good	Good
Proximal anatomic shape	Very Good	Very Good	Very Good
Radiographic assessment	Very Good	Very Good	Very Good
Patient satisfaction	Very Good	Very Good	Very Good
Postoperative sensitivity and dental vitality	Very Good	Very Good	Very Good
Secondary caries, erosion, abfraction	Very Good	Very Good	Very Good
Dental integrity	Very Good	Very Good	Very Good
Periodontal response	Very Good	Very Good	Very Good
Adjacent mucosa	Very Good	Very Good	Very Good
Oral and general health	Very Good	Very Good	Very Good

CONCLUSION

In both cases reported herein, the use of Filtek™ bulk-fill flowable (3M ESPE) and Filtek™ bulk-fill (3M ESPE) resins for restoration of occlusal carious lesions by means of the stamp technique yielded satisfactory clinical outcomes, which makes bulk-fill composite resins an excellent choice for restorations in pediatric dentistry. However, Case 1, treated with Z350 XT (3M ESPE) composite coating after placement of Filtek bulk-fill flowable resin produced better results because of the nanoparticulate nature of the material, achieving great aesthetic and functional outcomes after finishing and polishing.

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SKELETAL CLASS III MALOCCLUSION IN CONJUNCTION WITH EARLY CHILDHOOD CARIES INCREASES ORTHODONTIC TREATMENT COMPLEXITY: A CASE REPORT

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Palavras-chave: Má Oclusão Classe III de Angle. Cárie Dentária. Índice de Necessidade de Tratamento Ortodôntico.

RESUMO

Introdução: Vários índices objetivos de complexidade e necessidade de tratamento ortodôntico foram compilados ao longo dos anos, sendo que a maioria se baseou em características morfológicas da má oclusão. **Objetivo**: O objetivo deste artigo é relatar uma estratégia clínica para o tratamento de múltiplas cáries de primeira infância combinado à má oclusão esquelética de Classe III. **Relato de caso**: Paciente do sexo feminino, 5 anos, procurou tratamento odontológico com queixa de cárie dentária, dor e má oclusão. O plano de tratamento envolveu três etapas: alívio da dor, controle da doença cárie e restauração, e uma abordagem ortodôntica-ortopédica. O tratamento necessitou de uma mudança comportamental nos hábitos alimentares da unidade familiar que precedeu o tratamento da má oclusão. **Resultados**: O caso clínico, considerado complexo, produziu resultado satisfatório quando a atuação integrada das disciplinas de odontopediatria e ortodontia. **Conclusão**: A complexidade do tratamento ortodôntico em crianças também deve ser determinada pelo crescimento craniofacial remanescente e capacidade de colaboração do paciente e dos pais.

Keywords: Angle Class III Malocclusion. Dental Caries. Index of Orthodontic Orthodontic Treatment Need.

ABSTRACT

Introduction: Many objective indexes of orthodontic treatment complexity and need have been compiled over the years, most of which have been based on the morphological characteristics of malocclusion. **Objective**: The aim of this paper is to report a clinical strategy for treating multiple early childhood caries in conjunction with skeletal Class III malocclusion. **Case report**: A 5-year-old female patient sought dental treatment complaining of dental caries, pain, and malocclusion. The treatment plan involved three steps: pain alleviation, carious control and restauration, and, an orthodontic-orthopedic approach. Treatment also involved a behavioral change in eating habits of the family unit preceding the treatment of malocclusion. **Results:** The complex clinical cases can yield satisfactory outcomes when pediatric dentistry and orthodontic disciplines are integrated. **Conclusion**: Orthodontic treatment complexity in children should also be determined by remaining craniofacial growth and both patient and parent's adhesion and compliance.

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INTRODUCTION

Many objective indexes of orthodontic treatment complexity have been created over the years. Most have been based on the morphological characteristics of malocclusion, which include skeletal discrepancy, and are used to identify the orthodontic treatment needed, severity of malocclusion, difficulties in treating, and treatment outcome.[1] However, early orthodontic treatment can also be influenced by other parameters, such as patient compliance, remaining craniofacial growth, and other types of oral health impairment.[2]

Interceptive Class III malocclusion treatment is always challenging because of the doubtful

prognosis.[3] A treatment choice for 5 to 9-year-olds is the facemask with or without maxillary expansion, which improves overjet with limited influence on sagittal skeletal components, but without much long-term evidence.[3,4] Treatment outcomes depend on the magnitude and direction of remaining craniofacial growth. Severe cases with a clear family history may culminate in the need for orthognathic surgery after cessation of craniofacial growth, even with early orthopedic treatment.[3]

In addition, malocclusion in children may present simultaneously with other types of oral health impairment, such as early childhood caries, toothache and dental loss.[5] In Brazil, the prevalence of early childhood caries is 46% among two to three-year olds,[6] but can affect children of any ethnicity.[7] Occurrence is associated to low income households, little schooling, and larger families.[7-9] In such cases, preventive treatment is neglected and curative treatment is sought by the caregiver when a child feels pain or if carious lesions are perceived.[10]

It seems reasonable to assume that orthodontic treatment complexity increases in children when associated to multiple carious lesions. The aim of this case report was to present a clinical strategy for treating multiple early childhood caries in conjunction with skeletal Class III malocclusion. The CARE case report guidelines were followed.[11]

CASE REPORT

Patient information

A 5-year-old female patient was brought to the Children's Clinic at the Federal University of Goiás School of Dentistry, by her parents, complaining mainly of dental caries and pain. She had previously been treated by mass excavation and had temporary restorations of glass ionomer cement but did not continue with her treatment. This time, she came back complaining of odontogenic pain of intensity 2, according to the FPS-R scale, lasting more than a month.[12] The anamnesis showed that the child did not have supervised brushing and consumed excessive sugar. She had been breastfed exclusively in her first year of life.

Clinical and radiographic findings

The facial profile was concave in a hypodivergent pattern, but with facial thirds unbalanced due to lower third reduction. The lips were passively sealed and the smile-line was low, with marked short maxillary incisor exposition. Initial cephalometric data showed the presence of Class III skeletal malocclusion due to maxillary deficiency, a finding compatible with the facial analysis. In terms of dentition development, she was at the initial mixed dentition stage (eruption of 26, 36, and 46). Her occlusal situation was characterized as Class I, based on the canine relationship with complete anterior crossbite and 50% overbite. The right permanent first molars (16 and 46) were in crossbite probably because of a mild maxillary atresia. An intraoral examination detected the presence of multiple temporary restorations which needed replacing (teeth 51, 52, 53, 54, 61, 62, 63, 64, 65, 74 and 84), and absence of teeth (75 and 85) (**Figures 1**).



***Figure 1**: Pre-treatment photographs.*

Diagnostic assessment

The patient presented a Class III skeletal pattern due to combination of maxillary retrognathism and mandibular prognathism, resulting in a concave facial profile (ANB= -1.5 degrees, Witts= -6.0 mm, SNA= 80.0 degrees, SNB= 81.5 degrees, NAP= -3.0 degrees). Maxillary involvement was also detected in the transversal and vertical dimensions, respectively, due to maxillary atresia and decreased lower facial height with a short smile (SN.GoGn= 29.0 degrees). The functional examination of the occlusion was performed and it was confirmed that there was no functional anterior mandibular shift. The canine sagittal relationship was in Class I and the incisal overjet was negative with anterior crossbite of the four upper incisors. The child also presented with an early loss of lower second primary molars (teeth 75 and 85), multiple temporary restorations and dental caries, pain, and poor oral hygiene.

Therapeutic intervention

The treatment plan was based on three steps: 1- Pain alleviation by eliminating the foci of infection, 2- Carious control and restauration, and 3- Orthodontic-orthopedic treatment. For this purpose, a psychological behavioral conditioning of the patient was undertaken. The first procedures involved oral hygiene instruction and a change in eating habits, extraction (tooth 82), endodontic treatment (tooth 63), dental restorations with composites (teeth 63, 53, 55) and ionomer sealant (tooth 65). During dental restorations, several teeth exfoliated (teeth 51, 52, 61, 62).

After oral health was reestablished, the orthodontic planning involved the use of fixed space maintenance in the edentulous region (teeth 75 and 85), and maxillary atresia and Class III correction through a modified Haas expander followed by a Petit face mask for reverse traction.



***Figure 2**: Orthodontic-orthopedic treatment performed with modified Haas type expander and Petit facial mask.*

Follow-up and outcome

The integrated treatment was performed as planned. With the treatment of carious lesions and the exchange of provisional restorations, bacterial plaque retention sites and infection foci were eliminated, and the oral environment was allowed to adjust. Endodontic (tooth 63) and extraction (tooth 82) treatments led to the relief of pain.

After behavioral and oral health preparation, orthodontic treatment was started. The first orthodontic step was to correct the maxillary atresia by inserting a modified Haas type expander in the second molars and canines. The caregiver was given instruction on the expander activation protocol which consisted of a 1/4 turn twice a day until overcorrection was reached. This process took 2 weeks. The upper dental arch was expanded in intercanine and second molar distances by 4 mm and 5 mm, respectively. During the retention, a Petit type face mask was inserted with medium ½ elastics retained on the expander hook near the maxillary canines with 400g force application on each side. The face mask was recommended for daily use at home (**Figure 2**). The patient received follow-up monthly treatment for 9 months until the bite was uncrossed. Exodontia of the upper deciduous canines was performed after removal of the expander to allow adequate alignment of the upper lateral incisors (12 and 22).



***Figure 3**: Follow-up photographs.*

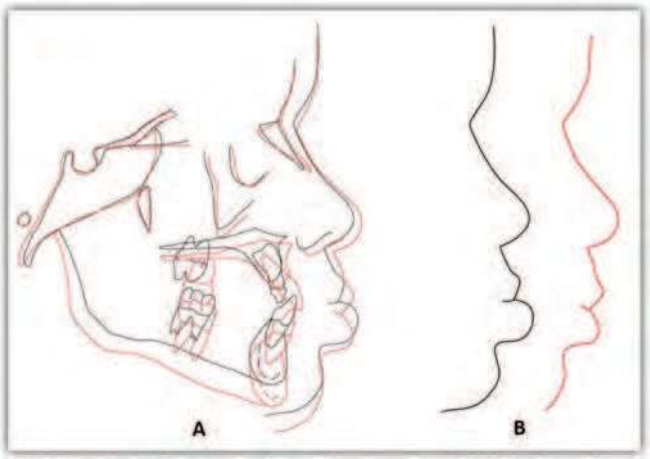


***Figure 4**: Total cephalometric superposition (A) and profile change (B).*

The post treatment short-term results showed a significant improvement in oral health, occlusal relations and facial profile. Greater forward lip projection and increased upper lip vermilion exposure contributed to face harmonization and enhanced the child's self-esteem. **Figures 3** and **4** show the clinical and radiographic improvement after treatment and follow-up (final cephalometric data: ANB= 3.0 degrees, Witts= -1.5 mm, SNA= 81.5 degrees, SNB= 78.5 degrees, SN.GoGn= 31.5 degrees, NAP= 1.0 degree).

DISCUSSION

Complex cases in children's dental clinics require close interdisciplinary integration for strategic clinical decision-making. The term "complexity" in orthodontics should be understood as the amount of effort or skill needed to obtain a successful outcome at the end of treatment and maintain it long-term.[1,2] This article reports a complex case involving a 5-year-old with multiple early childhood caries, pain, poor oral hygiene, and skeletal Class III malocclusion. Orthodontic-orthopedic intervention was recommended with caution because of an unfavorable overall prognosis. Indexes of orthodontic treatment complexity should be based on orthodontic elements, such as severity of the skeletal discrepancy and the unfavorable remaining facial growth, but should also include impaired oral health, such as tooth loss and multiple dental caries disease. In addition, treatment complexity should also be modulated by psychosocial and cultural factors, because treatment goals depend on both patient and parent's adhesion and compliance. Therefore, the concept of orthodontic treatment complexity in children should also include holistic parameters.

Carious disease in both generalized and advanced stages, and severe malocclusion, separately, can compromise a child´s quality of life and could result in their undergoing pain; speech, eating and sleep disorders; general suffering; and bullying. Integration of the specialist teams involved in child dental care is essential for successful treatment, as is education of the family unit.[13,14]

Integrated treatments must systematize a rational sequence of intervention. Treatment efforts must at first concentrate on pain alleviation, and then on carious control. The multifactorial etiology of dental caries goes beyond isolated curative treatment as it requires the involvement of the family in incorporating and maintaining new eating habits. This must be particularly stressed in terms of dietary control, and such preventive attitudes should be maintained for at least the first five years of life.[15] It is well known that dental biofilm one of the factors which triggers the development of caries, and the demineralization phenomenon is maximized when dietary sugar is recurrent. In the case reported, a survey of eating habits showed a diet rich in sugar and carbohydrate consumed at irregular intervals. In addition, the child was in the habit of getting a feeding bottle at night until she was three. The fact that the child took care of her own oral hygiene by herself, without parental supervision, was another aggravating factor. In this age bracket, motor coordination is vital for efficient brushing and cleaning with dental floss.

Preparation of the buccal environment can be grouped into several clinical procedures which aim to revert and control carious activity before definitive restoration and, as in the case reported, before embarking on an orthodontic-orthopedic approach. Its purpose is to quantitatively and qualitatively control buccal microorganisms, and lead to the remineralization by changing oral pH. Initial procedures could include the use of diary reporting of the diet every 3 days, daily mechanical control of biofilm by the patient assisted by parents which includes nightly brushing, using fluoride toothpaste and varnish, and restricting the consumption of cariogenic foods. After this preparation, the superficial part of the caries lesions (infected dentin) should be removed, in a procedure called mass excavation. The tissue removed is rich in denatured collagen and microorganisms abound, whereas in the deeper layer (affected dentin), the collagen is intact and there is a lesser concentration of microorganisms and greater potential for remineralization.[6,7,9,10,16]

Many objective indexes of orthodontic treatment complexity have been compiled over the years, most of which have been based on the morphological characteristics of malocclusion. Normally, pre-treatment dental casts and cephalometric data are used to classify the orthodontic treatment need and complexity. However, this simplistic concept should not be applied alone to orthodontic-orthopedic treatment of children.

The case reported showed cephalometric data and facial characteristics compatible with a skeletal Class III pattern, even with a Class I canine relationship. It is recommended that interceptive skeletal Class III malocclusion be treated using an orthopedic approach during the deciduous or mixed dentition stage, that is, before the pubertal growth spurt.[4,17] More recently, skeletal anchorage has been considered an alternative for patients after lower canine eruption or in early permanent dentition at the latest.[18] Inserting the T-spring was an additional feature used to promote correction of excessive uprightness in the upper incisors and accelerate correction of negative overjet, although the effect was exclusively orthodontic and could also be derived from reverse traction.[19]

Since posttreatment growth cannot be determined in advance, overcorrection of the horizontal overjet and the maintenance of the containment for an adequate period is essential. This should be clarified to the parents and the patient from the outset so that they are properly informed and invited to cooperate with the treatment.

CONCLUSION

Complex clinical cases can attain satisfactory outcomes by integrating pediatric dentistry and orthodontic disciplines. Behavioral changes in the family diet were essential in attaining the immediate goals and improving oral-health-related quality of life. Various factors, such as the severity of the malocclusion, oral health impairment, patient compliance, psychosocial and cultural factors and others can influence orthodontic treatment complexity in children, because treatment goals depend on both patient and parent's adhesion.

Informed consent

Informed consent was obtained from the parents in this study.

Disclosure statement

No potential conflict of interest was reported by the authors.

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The Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal) accepts the spontaneous submission of original articles, clinical case reports, reviews, letter sot the editor and editorials/review comments, and letters to the editor.

Original articles include randomized and controlled studies; studies of diagnostic tests and triage; observational cohort, case control and cross-sectional studies; other descriptive and experimental studies, as well as those of basic research with laboratory animals. The text must have a maximum of 3.000 words, excluding tables and references; the number of references must not exceed 30. Articles that report clinical trials with therapeutic interventions must be registered in one of the Registers of Clinical Trials

listed by the World Health Organization. In the absence of a Latin American Register, the Revista do CRO-RJ (Rio de Janeiro Dental Journal) suggest that the authors use the following register www.clinicaltrials.gov, of the National Institute of Health (NIH). The Identification Number must be presented in the body of the manuscript. The submission of clinical trials must adhere to CONSORT checklist (http://www.consort-statement.org/). In cases of submission of observational studies, for preparation of the manuscript, adhesion to the STROBE guidelines is requested (https://www.strobe- statement.org/index.php?id=strobe-home).

Clinical Case Reports must not exceed 2000 words, including the abstract, brief introduction, description of the case, discussion, acknowledgments (if there are any), and up to 20 references. A maximum of 4 figures are allowed. The figures may be organized in the form of a panel. Each panel will be considered a figure. The abstract must not exceed 200 words. Case report articles must be accompanied by the term of free and informed consent signed by the participant and/or his/her legal guardian. For preparation of the manuscript, authors must adhere to the guidelines suggested in CARE (http://www.care-statement.org).

Reviews are critical and orderly assessments of the literature relative to topics of clinical importance, with emphasis on factors such as the causes and prevention of diseases, their diagnosis, treatment and prognosis. Systematic reviews and meta-analyses are included in this category. In the body of the manuscript of the latter two types of reviews, authors must include the Registration Number of the Review protocol in PROSPERO (http://www.crd.york.ac.uk/PROSPERO/). For preparation of the manuscript, authors must follow the guidelines proposed by PRISMA (http://www.prisma-statement.org/). Authors may also submit a proposal of a review article, with a script, to the Editorial Board. If this is approved the author may develop the script and submit it for publication. Review articles must be limited to 6.000 words, excluding references and tables. The bibliographic references must be up-to-date and a minimum number of 30.

Letters to the editor must contain comments with a constructive critical content about subject matter previously published in the Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal). These must be submitted directly to the Editorial Board. The maximum size is 500 words, including a maximum of 6 bibliographic references. Whenever possible, a reply to the authors will be published together with the letter.

Editorials and comments are commissioned from authorities in specific areas. The Editorial Board may also analyze proposals of spontaneously submitted comments.

General Guidelines

The manuscript must be written using 12-point Arial font, on A4 size pages, with 1.5 line spacing, and a 3 cm margin on each side of the page, including the bibliographic references and titles/legends of tables and illustrations. The file must be presented in digital format, extension “doc” or “docx”. Each section must start on a new page, in the following order; title page, abstract in Portuguese, Abstract in English, text, acknowledgments, bibliographic references, tables (each complete table, with title and footnotes, on a separate page), figures (each complete figure, with titles and footnotes, on a separate page) and figure legends.

The following are the main guidelines about each section, according to the type of manuscript:

Title Page

The title page must contain all of the following items of information:

a) Title of the article, concise and informative, avoiding the use of superfluous terms and abbreviations; also avoid indicating the place and city where the study was conducted;

b) Abbreviated title (short title) to be stated at the top of all the pages) with a maximum of 60 characters, counting the spaces;

c) The full name of each of the authors (first name and other surnames, with the last surname typed in bold-face font.

d) Department to which the authors are affiliated and/or definition of the institution or official service to which the study is tied;

e) ;e-mail address of each author;

f) Specific contribution of each author to the study;

g) Declaration of conflict of interest (write “nothing to declare” or a clear revelation of any interest of an economic or other nature that may cause embarrassment if it becomes known after publication of the article);

h) Name, address, telephone, fax and e-mail address of the corresponding author;

i) Source of financing or supplier of equipment and materials, if this were the case;

j) Total word count of the text, excluding the abstract, acknowledgments, bibliographic references, tables and figure legends;

k) number of tables and figures;

Resumo/ABSTRACT

The "resumo" and abstract must contain a maximum of 250 words or 1.500 characters, avoiding the use of abbreviations. No words that identify the institution or city where the article was written must be put into the abstract, to facilitate blind reviewing. All the information that appears in the abstract must also appear in the article. The abstract must be structured according to the following description:

Abstract of Original Article

Introduction (optional): introduce the reader to the topic to be addressed in the article.

Aim: inform the initial hypotheses, if there are any. Define the main aim and inform only the most relevant secondary aims.

Methods: Inform the type of study design, contextual or local, the patients or participants (define the eligibility criteria, sample number, sample distribution criteria among groups, etc.), the interventions/ exposures (describe characteristics, including methods of application, variables analyzed, duration, etc.), and the criteria for measuring the outcome, including the statistical analysis.

Results: Inform the main data, confidence intervals and significance, the statistics of the findings.

Conclusions: Present only those supported by the data of the study, and that contemplate the aims, as well as their practical application with equal emphasis on the positive and negative findings that have similar scientific merits.

Abstract of Case Reports

Introduction (optional): inform the reader about the topic to be addressed.

Aim: briefly state the aims of the report.

Report: report the case itself.

Results: Inform the main data related to resolution of the case.

Conclusions: Present only those supported by the data of the study, and that contemplate the aims and their application.

Abstract of Reviews

Introduction (optional): briefly report the central topic of the review, and justify why it was conducted.

Aim: Inform the aim of the review, indicating whether it especially emphasizes some factor, risk, prevention, diagnosis, treatment or prognosis.

Sources of data: Describe the sources of the research, defining the databases and years researched. Briefly inform the eligibility criteria of articles and methods of extraction and evaluation of the quality of information (in cases of Systematic Reviews).

Summary of data: Inform the main results of the research, whether they are quantitative or qualitative.

Conclusions: Present the conclusions and their clinical application.

After the summary of the original articles, case reports or reviews, include three to six key-words that will be used for indexing. Use terms of Medical Subject Headings (MeSH), available in http:// www.nlm.nih.gov/mesh/ meshhome.html. When adequate descriptors are not available, it is possible to use free terms.

Abbreviations

These must be avoided, because they hamper comfortable reading of the text. When used, they must be defined when they are used for the first time. They must never appear in the title and abstracts.

Texts:

The text of **original articles** must contain the following sections, each with its respective sub-title:

Introduction: Clear, objective, succinct, citing only references strictly related to the topic, and seeking to justify why the study was conducted. At the end of the introduction, the aims of the study must be clearly described.

Methods: Describe the population studies, sample and eligibility criteria; clearly define the variables and detail the statistical analysis; if necessary, include references about the methods used during the course of this section. Procedures, products and items of equipment used must be described in sufficient detail to allow reproduction of the study. Furthermore, they must contain details of the brand and place of manufacture. In case of studies with human beings and/or animals, it is mandatory to include a declaration that all the procedures were approved by the research ethics committee of the institution to which the authors belong. In the absence of this, approval must be obtained from another research ethics committee indicated by the National Commission of Research Ethics of the Ministry of Health.

Results: These must be presented clearly, objectively and in a logical sequence. The information contained in tables or figures must not be repeated in the text. The option to use graphs instead of tables with a large number of data depends on the authors and Editorial Board, which may suggest changes and adjustments with the purpose of making them better suited to the guidelines and specificities of the Revista de Odontologia do CRO-RJ (Rio de Janeiro Dental Journal).

Discussion: This must interpret the results and compare them with data previously described in the literature, emphasizing the new and important aspects of the study. Discuss the implications of the findings and their limitations, as well as the need for additional researches. Avoid repetition of the results and/or superimposition between results and discussion. The conclusions must be presented at the end of the discussion, and must respond to the aims of the study, by avoiding information if inferences were not supported by the findings. The authors must place equal emphasis on favorable and unfavorable findings that have similar scientific merits. Include recommendations, when these are pertinent.

The text of **case reports** must contain the following sections, each with its respective sub-title:

Introduction: Clear, objective, succinct, citing only references strictly related to the topic, and seeking to justify why the study was conducted. Describe the aims at the end of the introduction.

Report: must present details of the case and procedures for performing them. Describe the follow-up data and prognosis of the case, when pertinent. CRO suggests that cases without due conclusion should be avoided. Mention the Term of Free and Informed Consent.

Discussion: Discuss the diagnostic, therapeutic and technical criteria used, among other details about the case. Discuss the clinical implications of the findings and their limitations. The conclusions must be presented at the end of the discussion, and must respond to the aims of the study, by avoiding information if inferences were not supported by the findings. The authors must place equal emphasis on favorable and unfavorable findings that have similar scientific merits. Include recommendations, when these are pertinent.

The text of **review articles** must contain the following topics: - In case of **narrative reviews**, the following are suggested: **Introduction**: clear and objective, in which the authors explain the importance of the review to clinical practice, in the light of dental literature. The introduction must conclude with the aims of the review.

Design: It is necessary to describe the methods of data selection and extraction, followed by Data Synthesis.

Synthesis: This data synthesis (result/discussion) must present all the pertinent information in rich detail.

Conclusion: The conclusion section must correlate the main ideas of the review with the possible clinical applications, limiting generalization to the domains of the review.

- In cases of **systematic reviews, with or without meta-analyses**, the authors must follow the PRISMA statement (http://www.prisma-statement.org/). These reviews must contain: **Introduction**: that demonstrates the pertinence of the subject and the existent controversy with respect to the topic. At the end of the introduction, the authors should raise the focal question of the review. **Methodology**: must present the search strategy; eligibility criteria of the studies; risk of bias analysis of the included studies; data extraction, and when pertinent, the strategy used for quantitative data synthesis.

Result: must respond in an orderly manner to the data searched according to the methodological design with respect to the qualitative and quantitative synthesis of the primary studies included.

Discussion: must consider interpreting the results, emphasizing resolution of the controversies related to the topic, with this being directed towards answering the focal question of the review, showing whether or not there is need for further research. The limitations of the study must also be pointed out

and envisage the external validity of the study (power of generalization of the data).

Conclusion: The conclusion section must correlate the main ideas of the review with the possible clinical applications.

Acknowledgments

These must be brief and objective; they should only mention the person or institutions that made a significant contribution to the study, but that had not fulfilled the criteria of authorship.

Bibliographic References

The references must be formatted in the Vancouver style, also known as the Uniform Requirements style.

The bibliographic references must be numbered and ordered according to the order in which they appear in the text, in which they must be identified by the respective superscript Arabic numbers. To list the references, do not use the Word resource of end notes or footnotes.

Articles accepted for publication, but not yet published, may be cited provided that the name of the journal is indicated and that it is "in press". Unpublished observations and personal communications may not be cited as references. If it were imperative to include information of this type in the article, it must be followed by the observation "unpublished data" or "personal communication" in parentheses in the body of the article.

The titles of periodicals must be abbreviated as recommended in the Medicus Index; a list with their respective abbreviations may be obtained by means of the publication NLM "List of Serials Indexed for Online Users", available at the address http:// www.nlm.nih.gov/tsd/serials/lsiou.html.

As follows, we present some examples of the model adopted by the Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal):

Articles in periodicals:

1. Up to six authors:

Vieira AR, Bayram M, Seymen F, Sencak RC, Lippert F, Modesto A. In Vitro Acid-Mediated Initial Dental Enamel Loss Is Associated with Genetic Variants Previously Linked to Caries Experience. Front Physiol. 2017 Feb 22;8:104. doi: 10.3389/fphys.2017.00104.

2. More than six authors:

da Silva Bastos Vde A, Freitas-Fernandes LB, Fidalgo TK, Martins C, Mattos CT, de Souza IP, et. al. Mother-to-child transmission of Streptococcus mutans: a systematic review and meta-analysis. J Dent. 2015 Feb;43(2):181-91. doi: 10.1016/j.jdent.2014.12.001.

3. Organization as author:

American Academy of Pediatrics. Clinical practice guideline. Diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics 2012;130 (3):576-684.

4. Articles with electronic publication, not yet with printed publication:

Tavares Silva C, Calabrio IR, Serra-Negra JM, Fonseca- Gonçalves A, Maia LC. Knowledge of parents/guardians about nocturnal bruxism in children and adolescents. Cranio. 2016; Jun 24:1-5. [Epub ahead of print]

Books:

Andreasen JO, Andreasen FM. Textbook and color atlas of traumatic injuries to the teeth. 4ª ed. Copenhagen: Mosby. 2007.

Chapters of Books:

Pagel JF, Pegram GV. The role for the primary care physician in sleep medicine. In: Pagel JF, Pandi-Perumal SR, editors. Primary care sleep medicine. 2nd ed. New York: Springer; 2014.

Academic Studies:

BorkowskiMM. Infant sleep and feeding: a telephone survey of Hispanic Americans [dissertation]. MountPleasant(MI): Central Michigan University; 2002.

CD-ROM:

Soils. Geographica on CD ROM. [CD ROM]. Melbourne, Australia: Random House. 1999.

Homepage/website:

Integrative Medicine Center[Internet]. Houston: University of Texas, M. D. Anderson Cancer Center; c2017 [cited 2017 Mar 25]. Available from: https://www.mdanderson.org/patients- family/diagnosis-treatment/care-centers-clinics/integrative- medicine-center.html.

Ministry of Health Documents/Decrees and Laws:

1. Brazil. Decree 6.170, of July 25, 2007. States provisions about the rules relative to Transfers of resources from the Union by means of transfer agreements and contracts and makes other provisions. Diário Oficial, Brasília, 26 jul. 2007.

2. Brazil. Ministry of Health Health Care Secretary Department of Primary Care Política Nacional de Atenção Básica / Ministério da Saúde. Health Care Secretary Department of Primary Care Brasília, Ministério da Saúde, 2012. (Série E. Legislação em Saúde)

Presentation of Paper/Study?

Pierro VSS, Maia LC, Silva EM. Effect of pediatric syrups on roughness and erosion of enamel (abstract). 82nd. IADR General Session & Exhibition; 2004 Mar 10-13, Honolulu, Hawaii. J Dent Res 2004, 83 (Special Issue A): 896.

Tables

Each table must be presented on a separate page, numbered with a Arabic numeral (1, 2, 3, etc.), in the order of appearance in the text; with single spacing between lines, and contain a summarized but explanatory title. All the explanations must be presented in footnotes and not in the title, identified with superscript letters in alphabetical order. Do not underline or draw lines within the tables and do not use spaces to separate the columns. Do not use space on either side of the symbol ± or any other symbol.

Figures (photographs, drawings, graphs, etc.)

All the figures must be numbered with Arabic numerals (1, 2, 3, etc.), in order of appearance in the text. The title must be clear and objective, and must appear at the base of the Figure. All the explanations must be presented in the legends, including those about the abbreviations used. Figures reproduced from other previously published sources must indicate this condition in the legend, in addition to being accompanied by a letter of permission from the copyright holder. Photographs must not allow identification of the patient; masking the patient's eye region in the photograph may not provide sufficient protection. Should there be possibility of identification, it is mandatory to include a written term of free and informed consent to publication. Microphotographs must present internal scales and arrows in contrast with the background.

Illustrations in color are accepted for publication online, without additional cost to the authors. However, all the figures will be transformed to black and white in the printed version. If the authors consider it essential for a certain image to be in color, even in the printed version, the authors are requested to make special contact with the editors. Computer-generated images, such as graphs, must be attached in the form of files in the following formats: .jpg, .gif or .tif, with minimum resolution of 300 dpi. Graphs must preferably be presented in two dimensions. CRO will only accept

drawings, photographs or any illustrations that contain an adequate degree of resolution for the printed version of the journal.

Figure Legends

These must be presented on a separate page, duly identified with their respective numbers.

Verification List

As part of the submission process, authors are requested to indicate their agreement with the items listed as follows:

1. All the authors will sign and submit their agreement by means of a Copyright License Declaration (and end user license), and the content of their intellectual work will be their sole and exclusive responsibility.

2. The corresponding author must prepare, with the consent of the other authors, a letter of submission of the article to the Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal).

3. The submission file (manuscript) must be sent as a Microsoft Word document.

4. The title page must contain all the information required, as specified in the guidelines to the authors.

5. The abstract and key words must be formatted and submitted in English and Portuguese, following the title page.

6. The entire text must be presented in double line spacing using 12-point Arial font, and using italics instead of underlining to indicate emphasis (except in e-mail addresses. All the tables, figures and legends must be numbered in the order in which they appear in the text; each of these must be placed on a separate page, after the bibliographic references at the end of the article.

7. The text must be in accordance with the demands of style and bibliography described in the publication guidelines.

8. The references must be presented in the so-called Vancouver style, and numbered consecutively in the order in which they appear in the text.

9. Information about approval of the study by a research ethics committee must be clearly presented in the text, in the Methods section, and must be sent as an attachment.

10 All the internet addresses presented in the text must be active and ready to be clicked on.

11.Documentary proof of potential Conflict of Interest must be signed by all the authors and sent as an attachment during the submission process.

Final Considerations:

Anti-Plagiarism Policy

The Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal) uses a system to detect plagiarism (available at http//:www.plagium.com/pt/detectordeplagio). When submitting an article to the journal, the authors accept that the work will be digitized in the mentioned program at the time of submission, and in the case of acceptance, prior to publication.

Ethics Policy of the Publication

All submissions will be subject to the condition that the articles have not been previously published, and have also not been simultaneously submitted to another medium of disclosure. All the authors must have read and approved the content and all the authors have declared possible conflicts of interest. The article must follow the ethical principles

of the Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal), and they must also comply with the international standards of research ethics in studies with human beings and animals.

Conflict of interest and financial aid

The Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal) requires all authors to declare potential conflicts of interest. Any interest or relationship, financial or other type that may be perceived as having influenced the results of a study, and the objectivity of an author, is considered a potential source of conflict of interests, and must be declared. The potential sources of conflict of interest include, but are not limited to, rights arising from patent rights or ownership of shares, membership of a board of directors, membership of an advisory board or committee of a company, and receiving advice or speaking fees from a company. If the authors are not sure whether a past or present affiliation or relationship needs to be divulged in the manuscript, please contact the editorial office at http://revcientifica.cro-rj.org.br

The existence of conflict of interests does not exclude publication.

The corresponding author is responsible for ensuring that all the authors fulfill and sign the copyright license declaration and other mandatory documents at the time of submission.

Confirmation of sending the documents

After submission, the corresponding author will receive an e-mail to confirm receipt of the article. If this e-mail of confirmation is not received after 24 hours, please contact the Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal) by e-mail: revistacientifica@cro-rj.org.br. The error may have been caused by some type of spam filtering in the e-mail server.

Updating the status of the article

The initial process of evaluating the article may take up to 60 days, counted from the date of its submission. Should this period have expired, you may contact the Editorial Board to verify the present status. The Revista Científica do CRO-RJ (Rio de Janeiro Dental Journal) will inform you by e-mail, once a decision has been made. One of the following possibilities will be indicated in the reply e-mail: 1. Make adjustments to suit the guidelines and Re-submit; 2. Accepted; 3. Minor adjustments required; 4. Major adjustments required; 5. Rejected. In the latter case, the article will be summarily refused and cannot be re-submitted to the journal.

Submission of Revised Articles

The revised manuscripts must be sent within 2 months after notifying the authors about the conditional acceptance (minor or major adjustments). All the revisions must be accompanied by a letter of response to the reviewers, in which each question or suggestion made by the reviewers must be answered in sequential order. The letter must a) detail the author's reply, point by point, to each of the reviewers' comments, and b) a revised manuscript, highlighting in color, exactly what has been changed in the manuscript after revision. In addition to this, any need for adjustment or correction of the manuscript is the sole responsibility of the authors.

The authors must supply an official certificate of revision of the English language in the act of submitting the revised manuscript. The authors will be fully responsible for the costs of translation/revision of the English language.

Para o CRO-RJ, longe é um lugar que não existe.

Cursos, palestras e eventos de Odontologia na sua cidade. Consulte a programação no site: www.cro-rj.org.br



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