

Esthetic transformation of conoid lateral incisors with composite resin and digital planning

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ABSTRACT

Objective: the aim of this study is to, based on a review of the literature, relate a clinical case of an esthetic transformation of conoid lateral incisors, through the direct adhesive technique, using composite resins and aid of digital planning. **Material and Methods:** a literature research was made on electronic databases, including PUBMed and Scielo, with the key terms of (Microdontia) OR (Dental esthetics) AND (Composite Resin OR Composite Resins) AND (Anterior teeth) AND (Digital Smile Design) (Microdontia) AND (Estética Dental) AND (Resina Composta OR Resinas Compostas) AND (Dentes Anteriores). Also, 34 papers were selected after this first filter, in which the full text available was considered of good quality and relevant to the context. The publication time was limited to the 17-year period through 2018. **Results:** the result of the restorations fulfilled esthetically to the patient's desires, who demonstrated joy and satisfaction, respecting all the biological principles of a minimally invasive philosophy. **Conclusion:** it was possible to conclude that this is a minimally invasive technique that preserves health dental structure, with a reduced chair time. In addition, it is an option of low cost for the patient and offers a possibility of reversibility.

Keywords: Microdontia; Esthetics; Composite resins.

Introduction

Beauty and esthetic harmony are objects of study since antiquity. Philosophers believed that the beauty was directly related to proportionality and this proportion was seen in the nature forms. The human need to understand the world, its laws, structure and compositions started to consider the face and its peculiarities.¹

With the technology development, along with the far reaching of the mass media and the appearance of a consumerist society, an oral "beauty pattern" was created. This pattern considers that an individual is better accepted in the society if he has light, aligned and with the appropriate proportion's teeth. Obviously, it is about a reductionist concept, therefore, it is up to the professional to consider, at first, aspects related to health production and self-care.^{2,3}

However, it is a fact that some anomalies in the oral cavity are unwished and can represent, to some individuals, limiting factors to social relationships.² The search to esthetic procedures has significantly raised since, one time unsatisfied with irregularities in the smile, or driven only by the wish to improve the appearance, many people search for dentistry treatment.⁴ That way, the Dentistry finds itself in a continuous advance, not only contributing to the maintenance of the oral health, but also providing resources to associate esthetic, to functional and biologic aspects.⁵

The appearance of the smile is directly related to the self-esteem, to the psychological and self-acceptance of the individual in the society.^{6,7} Countless factors can negatively influence the harmony of the smile, among them, the dental anomalies stand out. They can be related to alterations of shape, size, position, color and texture of the anterior maxillary teeth.^{5,7,8,9,10,11}

Hypodontia is an anomaly characterized by the lack of development of one or more teeth and is related to microdontia. The upper lateral incisors are the more commonly affected by microdontia. Women are more affected and that anomaly is more frequent in permanent dentition. Usually, the lateral teeth affected presents a crown in a cone shape on a normal length root.¹²

Conoid teeth are usually associated with diastemas and gives an infantilized aspect to the smile.¹¹ To correct this disharmony, it is important that the dentist make a correct diagnosis and esthetic-functional planning according to the need and conditions of the patient.¹³

The planning to reestablish the anatomic characteristics of the conoid incisors must be multidisciplinary.¹¹ Among the existent treatments, the orthodontic device and the direct and indirect restorations stand out.

The orthodontics is indicated to close big diastemas, rotation and severe angulations. However, in some situations, there are limitations such as not reaching the ideal approximation of the teeth, being a long-term treatment and providing some discomfort. Added to those factors, there are cases where there is a need for esthetic correction subsequent to orthodontic treatment.

Direct restorative techniques using composite resins are another option for the treatment of conoid lateral incisors. They present advantages over indirect ones, as there is preservation of the dental structure, lower cost, a smaller number of consultations, easiness for eventual repairs, and reversibility of the treatment. The success of the technique is directly related to the planning, professional ability, type of bonding, composite resin quality and photopolymerization.¹³

A greater search for esthetic treatments in Dentistry caused the incorporation of tools that aid the diagnostic vision, the communication between professional and patient and the communication among the professionals of the team. In addition, they ensure a greater predictability in the smile design and treatment to be performed. Digital Smile Design (DSD), through basic photographs specific to it and softwares such as keynote or PowerPoint, enables analyses, documentation and communications in contemporary cosmetic dentistry.¹⁴

The purpose of this study is based on a review of the literature, report a clinical case of esthetic transformation of conoid lateral incisors, performing the direct restorative technique with composite resin with aid of digital planning.

Material and Methods

A literature research was made on electronic databases, including PUBMed and Scielo, with the key terms of (Microdontia) OR (Dental esthetics) AND (Composite Resin OR Composite Resins) AND (Anterior teeth) AND (Digital Smile Design) (Microdontia) AND (Estética Dental) AND (Resina Composta OR Resinas Compostas) AND (Dentes Anteriores). The found papers were analyzed regarding the title and abstract contents in order to eliminate the ones that were out of context and not relevant to the review.

Also, 34 papers were selected after this first filter, in which the full text available was considered of good quality and relevant to the context. The languages of the papers were predominantly English and Portuguese. The publication time was limited to the 17-year period through 2018, with a focus on the latest articles.

The methodology also included reporting a clinical case of esthetic transformation of conoid lateral incisors, performing a direct restorative technique with composite resin, with the aid of digital smile planning.

Results

1- Review of literature

Conoid teeth

Dental anomalies occurring in the anterosuperior region can directly interfere with the esthetics of the smile, in addition to, in some cases, triggering functional problems. The anomalies can be classified according to size, number, structure and shape. Because they develop in some individual characteristics that are not consistent with normality, in the majority of the population, they can cause psychological discomfort in many circumstances.^{2,6,7,9,16,17}

According to Neville¹² *et al.* (2009) the isolated microdontia is represented by an alteration in tooth size, in which the upper lateral incisor is most commonly affected. In such anomaly, the mesio-distal diameter of the lateral tooth is reduced, so that the proximal surfaces converge to incisal edge

and consequently give the conoid shape to the tooth.

The prevalence of the anomaly in the population varies between 0.8 and 8.4% more frequently in women. A probable mutation in the msx-1 gene with autosomal dominant inheritance pattern results in the atypical shape of the upper lateral incisors.

The anomalous shape of the conoid tooth damages the esthetic harmony of the anterior segment. Also, because they have reduced mesio-distal diameter and consequently have lower dental structure, these teeth are one of the main responsible for the existence of diastemas. It is common for dental migration and disturbance of position (rotation) to occur in an attempt to fill the interdental space.¹⁵

Esthetic principles

To Conceição¹⁹ *et al.* (2009), the emergence of a consumerist society, combined with the technological development of restorative materials, justifies the greater appreciation of esthetic dentistry. It is up to the dentist to analyze the patient as a whole individual, identifying both macroscopic aspects (face and periodontium) and microscopic (teeth), in order to perform an adequate treatment plan and hence the correct implementation of esthetic restorative treatment.

A smile is considered pleasant when parameters of facial and tooth morphology are in balance. To achieve this, it is extremely important that the clinical is aware of the esthetic principles. Parameters such as size, shape and proportion are essential in the construction of the harmonic smile.¹ However, it is worth noting that the dentist should not impose a "beauty standard" on the patient, he should use the esthetic principles as a guide to develop an individualized treatment plan.^{18,19}

The esthetic analysis begins by seeking the patient's true expectations, designing his psychological and emotional profile. The perception of beauty is related to cultural, temporal and social values, therefore, the importance of analyzing each individual as a single being and from this analysis, carry out their planning.^{5,19,20,21}

According to Higashi²⁰ *et al.* (2006), the requisition of periapical radiographs, study models and digital photographs in the first consultation, are of utmost importance for a detailed analysis of the patient's characteristics, besides serving as a guide in planning. Digital photographs also help in communication between dentist and patient and dentist and laboratory.

Face Dental Analysis

The esthetic balance is established on the face and the planning and execution of the dental treatment must be integrated with it. The first perception on the face is the attempt to determine its contour, which may be ovoid, triangular or quadrangular. Later, the smile is considered. Smile

is the most important region on the face because it concentrates longer observation time of one individual over the other. Followed by eyes, nose, hair and other details.¹⁹

Through horizontal and vertical lines on photographs it is possible to perform an esthetic analysis, seeking symmetry and proportionality between the thirds of the face. If there are significant changes in these parameters, the patient should be forwarded to orthodontics or oral maxillofacial surgery, depending on the type of alteration, whether dental or skeletal, respectively.¹⁹

The main facial lines are facial midline and interpupillary line. The facial midline should be drawn from the glabella, passing through the tip of the nose, philtrum and chin tip. It should be coincident or parallel with the midline, however, deviations up to 4 mm are disregarded in many cases.

The interpupillary line should pass over the pupils and is used as a reference for the contour of the gingival margin and incisal plane of the maxillary teeth. To ensure balance in dentofacial esthetics, it is necessary that the interpupillary, intercommissural and incisal planes are parallel to each other and at the same time perpendicular to the facial midline. This arrangement gives harmony to the dental composition with the face and is considered a constant in dental esthetics.^{19,22}

The smile frame is formed by the contour of the lips according to Cardoso²² *et al.* (2009). The curvature of the lower lip assists in determining the incisal plane during the smile, while the curvature of the upper lip serves as a reference for the length of the central incisors.

According to Conceição¹⁹ *et al.* (2009) and Hirata²³ *et al.* (2012), the type of smile is represented by how much exposure there is of the anterior superior teeth. In the high smile, any cervico-incisal length of the teeth is exposed and an adjacent gingival band can also be visualized. In the average smile, about 75% of the length of the teeth is apparent. While in the low smile, less than 75% of the length is evident.

Tooth proportion

Esthetic Dentistry aims to create, reproduce, copy and harmonize smiles through restorations, so that they become pleasant, expressive and imperceptible.⁵ The greatest difficulty of a restorative work is to return the natural shape of the tooth, as it depends not only on the material used, but also on the skill of the professional. Dentistry uses as reference the golden ratio in the search for harmonization between dental facial proportions.⁹

Levin in 1978 mentioned that the golden ratio or divine proportion has been used since ancient Greece and states that by dividing a straight line in an asymmetrical way, the larger segment is to the smaller, just as the sum of both is to the greater. The reason of this proportion is on the order of

1.618. That is, in a frontal view, the dental proportion should be decreasing from the central incisor, where the real size of the lateral incisor is, approximately, 60% of the size of the central incisor.^{1,22}

The proportion in relation to length and width of a tooth is 5:4, that means that the width of a central incisor corresponds to about 75 to 80% the size of its length. When this proportion is not respected, the tooth becomes extremely short or extremely long.^{22,23}

Digital Smile Design

The greater search for esthetic treatments in Dentistry caused the incorporation of tools that facilitate the diagnostic vision, the communication between professional and patient and the communication between the professionals of the team. They also ensure greater predictability in the smile design and treatment to be performed. Digital Smile Design (DSD), through basic photographs, specific to it and software such as Keynote or PowerPoint, enables analysis, documentation and communication in contemporary cosmetic dentistry.¹⁴

From initial photographs that portray the exaggerated smile and the half-open teeth, the face at rest and also intraoral photographs, it is possible to start planning with the DSD. Other photographs can also be taken to complement the planning, such as the one that portrays the patient in a 12-hour position. The analysis begins by determining the facial midline and the interpupillary line on the patient's photograph with an exaggerated smile and with half open mouth. Such lines lie perpendicular to each other.

After facial analysis, intraoral photography is adjusted (from reference lines), and all dental and gingival analysis is performed. The new smile frame is built using the 80% length / height ratio, proportion dental ruler, and pre-defined masks available in the DSD tool kit. These masks can be adjusted according to the will of the professional, ensuring a personalized and individualized work for each patient.

During the process a calibrated digital ruler is also used, which will guide future diagnostic waxing. After the ideal contour is established, there is filling with a similar texture to the patient's teeth and digital mockup is finalized.¹⁴

2- Case report

A 25-year-old male patient attended the dental clinic at the Federal University of Rio de Janeiro unsatisfied with the shape of his teeth and spaces between them, what affected the esthetics of his smile. After a detailed anamnesis, clinical and radiographic examination, the patient was diagnosed with isolated microdontia of the upper lateral incisors (12 and 22), also known as conoid teeth. To plan the case, extra oral (Figure 1A) and intraoral photographs were

taken with the iPhone 8 Plus (Apple®), and a study from alginate molding was made, at the first consultation.

Using photographs of the resting face, from the face with forced smile and half open mouth, intraoral and 12-hour position, the digital smile planning, Digital Smile Design (DSD), was conducted to guide diagnostic waxing and improve communication with the patient.

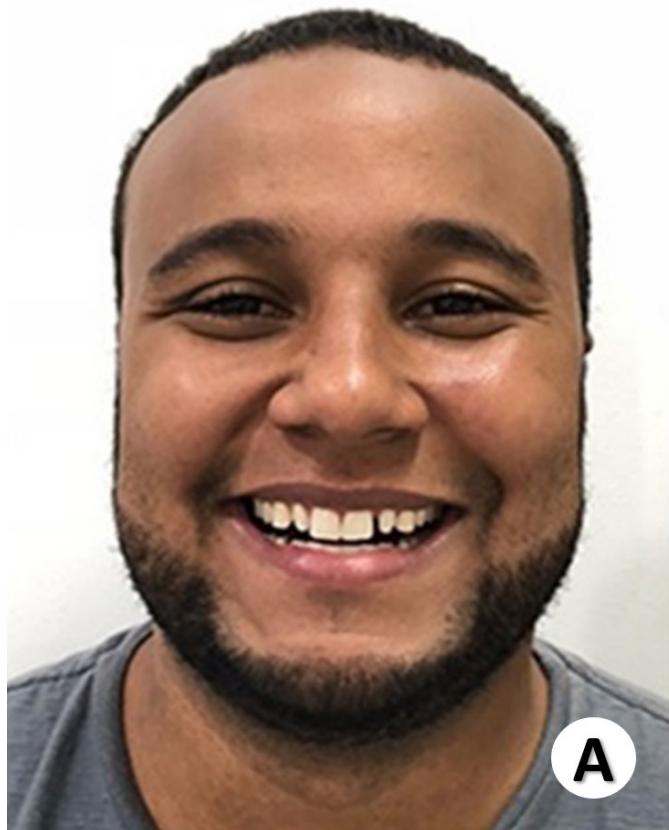


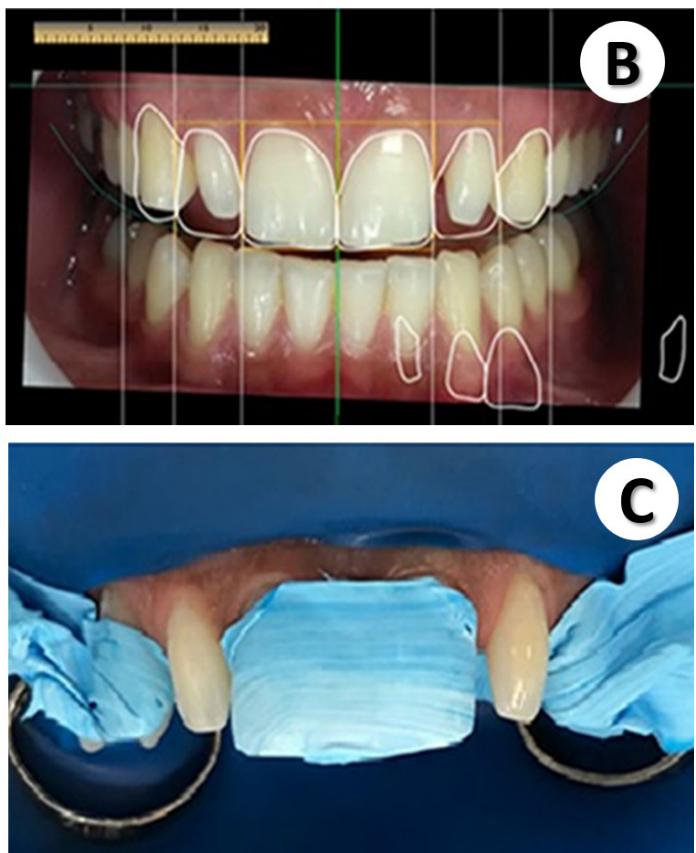
Figure 1. A: Extraoral photograph of the patient with half open teeth and forced smile. B: Ideal tooth contour established. C: Protection of adjacent teeth with a sealing tape.

Using the PowerPoint software, on the initial photograph of the face with the forced smile and half open teeth, the medial lines of the face and interpupillary were plotted. Then, the interpupillary line was used as a reference to trace the intercommissural line. The patient's lower lip was used as the basis for the curvature of the smile. For intraoral photo calibration, 3 transfer lines were used, later the intraoral photo was positioned behind the lines so that they reach the same points initially established.

With calibrated intraoral photography, digital planning can continue. By measuring the mesio-distal width of the central incisor in the plaster model, it was possible to regulate the digital ruler available in the DSD masking package. Despite the discrepancy between the facial midline and the interdental midline, the interdental line was considered as median, once the discrepancy observed in the digital rule was 2.0mm.

Through the use of the shape tool and the dental propor-

tion ruler, it was possible to analyze the ideal length and width of the teeth and subsequently determine their contour (Figure 1B). With the ideal shape established on the patient's teeth, it was possible to verify with the digital ruler the necessary additions in wax for diagnostic waxing. The intra-oral design was then transferred to the patient's face photograph and the finished digital mock up. In sequence, using



DSD as reference, the diagnostic waxing was performed.

In the second consultation, the following treatment possibilities were presented to the patient: indirect restoration using ceramic and direct restoration with composite resin. The last option was chosen. The patient accepted the proposed treatment and signed the free and informed consent, which was attached to his medical record.

For color selection, a prophylaxis was performed on humid teeth and without previous acid conditioning. Small increments of resin were inserted on the vestibular surface of the teeth to select the most similar color to the tooth's structure. To the dental anatomization, the A1 enamel (Vittra APS - FGM) and A1 dentin (Vittra APS - FGM) resins were selected for lateral and canine incisors and TRANS N (Vittra APS - FGM) for incisal edge of the central incisors.

After the color selection, the free-hand restorative technique with composite resin was done. With the patient

approval, the diagnostic waxing was molded with silicone condensation Putty Denso Profile (Coltene®) to form a silicone barrier to guide the contouring of the new dental anatomy.

In sequence, the pre-molar to pre-molar rubber dam use was made, exposing the entire cervical of the teeth that were going to be re-anatomized. A dental protection was made, before the acid conditioning and application of the adhesive system, using a sealing tape was used on adjacent dental structures (Figure 1C). After acid conditioning with 37% Condac phosphoric acid (FGM®) on the entire surface of the lateral incisors for 30 seconds, air / water spray washing was performed twice the acid conditioning time.

The excess moisture was removed with absorbent paper and a microbrush inserted the first drop of the Ambar APS adhesive system (FGM®) was inserted. After 10 seconds, the second drop was applied, followed by gentle air jets for solvent evaporation and polymerization for 20 seconds.

With the wall of silicone correctly adapted, the increase of the A1 composite for enamel on the entire palatine of 12 was inserted, followed by polymerization with the Optilight Prime (GNATUS®) photopolymerizer for 20 seconds (Figure 2A). The same procedure was performed at 22.

Removing the wall of silicone, the palatal contour of the defined restoration was observed, and increments of up to 1.5mm were performed with the resin A1 for dentin in 12. The instruments used for insertion were the Suprafil no2 (Millennium Golgran®) and the spatula smoothing with a

synthetic brush (Odontomega®), each followed by photoactivation for 20 seconds for enamel resin and 40 seconds for dentin resin. The restoration was completed with a final layer related to vestibular enamel. The same procedure was performed on 22.

The same steps of acid conditioning and application of the adhesive system were done in the central incisors, but only in the middle incisal portion by vestibular and palatine. With the Suprafil spatula, small increments of the TRANS N resin were incorporated in the centrals incisal in order to mask small wears, followed by smoothing with a brush and photoactivation for 20 seconds.

Repeating the acid attack process and the application of the adhesive in the canines on their entire vestibular and palatine surfaces, the resin increments were inserted after the silicone wall adaptation. The canines restore need was due not only to the esthetics compromised by the presented incisal wear, but also by the need to reestablish the canine guide, which was not defined. Reestablishing the canine guide, in the laterality movement protects the health of the stomatognathic system and the new esthetic restorations.

After removing the rubber dam use, the protrusive and laterality movements were performed, confirming the reestablishment of the incisors and the canine guidance, respectively. A roughly finish was performed in the same session and in subsequent consultation the most refined finish, using diamond tips of the Microdont® finishing kit, was made.



A



B



C

Figure 2. A: Properly positioned silicone wall. B: Final result: vestibular vision. C: Final result: photograph of the patient's smile.

On the incisors were used tip 3118F for the palatal surface and tip 3195F for the vestibular surface. In the canines only the 3195F tip was used. Polyester sandpaper strips (Microdont®) were used for the interproximal regions. After finishing, polishing rubbers (Microdont®) were used, respecting the sequence recommended by the manufacturer. With felt disc Diamond (FMG®) and Diamond Universal polishing paste (Maquira®) it was possible to achieve excellent results in these of the restorations (Figure 2B).

Their final result esthetically fulfilled the patient's desires, which demonstrated joy and satisfaction, respecting all the biological principles of a minimally invasive philosophy (Figure 2C).

Discussion

Smile is the most important segment in dental-facial cosmetic composition and the presence of dental anomalies in this segment can compromise its balance and harmony. Changes in the shape, size, position, color and texture of the teeth have increased the demand for dental treatments, as they can configure a pattern far from the one established by the media and society nowadays.^{7,8,11,17,24}

It is up to the dentist, after a detailed anamnesis and correct diagnosis, to evaluate the patient's expectations and to present the possible therapeutic solutions, highlighting the best technique and the most appropriate material for each clinical situation.²⁰

Isolated microdontia is a type of dental anomaly with higher prevalence in the upper lateral incisors. These teeth, called conoids, present a change in the shape and size of the crown, conferring an atypical and infantile smile to the patient. The presence of anterior superior diastemas associated with this morphological alteration and the reduction of the mesio-distal diameter of the lateral teeth, which allows dental movements, are very common.^{2,7,8,9,11,15,17,24}

In the initial approach, molding to prepare the study model, radiographs, as well as photographs from different angles so that the professional can observe and elaborate the treatment plan are very important.²⁰

In the present case, in addition to detailed anamnesis considering biological aspects and the patient's expectation, radiographs, study model and photographs were performed prior to the establishment of the treatment plan. In order to construct a harmonic smile, it was necessary to reproduce teeth proportionally to each other, to the other teeth and biologically in balance with the gingival tissues. Harmony with the face should also be considered.²⁵

Through DSD technology and PowerPoint software, it was possible to simulate, in the present case, esthetic and functional parameters, besides promoting closeness between professional and patient. With the DSD tool, a "design" was produced integrating the functional, emotional and esthetic needs of the patient, besides increasing the predictability of

the treatment.^{14,25}

The diagnostic waxing technique was not completely replaced by the digital mock up performed in digital smile planning. Through the waxing it was possible to visualize three-dimensionally the result desired by the patient and to build the esthetic treatment silicone wall.¹¹

For esthetic correction in the anterior segment, the professional can use direct or indirect dental anatomicization techniques. Indirect techniques, such as the manufacture of ceramic laminates or dental contact lenses, have advantages related to color stability, gloss stability and wear resistance. However, the need of dental preparation, the greater number of consultations, and the high cost, can represent limitations to the technique.^{8,11,24,26}

The current restorative dentistry advocates a minimally invasive philosophy, where the professional should choose, whenever possible, procedures with tissue preservation and avoid loss of healthy dental structure.²⁰

In the case report, to preserve healthy tooth structure and respecting patient's financial limitation, the direct adhesive technique with composite resin was chosen as a more viable procedure. Due to technological advances in cosmetic dentistry, current composites, are able to meet the esthetic requirements of imperceptible restorations. In addition, the use of composite resins for esthetic corrections has advantages over other techniques, due to reversibility possibility, lower patient costs and shorter chair time.^{10,13,19,27}

Among the types of resin available in the dental market, the nanoparticulate ones has great mechanical properties compared to previous resins and excellent esthetics. The presence of particles of 5 to 20 nanometers, represent 78% of the weight in load, allows greater surface smoothness and maintenance of the gloss.^{13,20}

In the reported clinical case, Vittra APS composite resin (FMG®) was used considering it was a composite nanoparticulate resin of significant esthetics indicated for all classes of restorations. A composite is formed by nanospheres of a silica-zirconia complex, where the zirconia particles impart high gloss and long-lasting polish. These characteristics, associated with a resistant polymer matrix, confer high wear resistance.

One of the key factors for the longevity of direct restorations is moisture control at the restorative moment. Because of that, the rubber dam use of the modified type was performed, which guarantees the maintenance of the dry operative field and the free gingival margins. Conventional rubber dam use can often hamper the insertion of resins in critical areas, such as the cervical. When there is lack of adaptation of the resin to the tooth, it favors the appearance of micro-infiltrations and consequently interferes in the longevity of the restoration.²⁰

The direct adhesive technique with the aid of the



previously made silicone guide increases the predictability in the correct positioning of the composite resin increments during the restoration.¹⁹

The insertion of increments of up to 1.5mm per layer allowed the best performance of the material. The polymerization, following the manufacturer's recommendations, were done for 40 seconds for dentin resin and 20 seconds for enamel resin and for effect. It is fundamental to follow the photoactivation guidelines of the manufacturers, as the appropriate technique allows obtaining better physicochemical properties. The low conversion of monomers to polymers results in a restoration susceptible to degradation, loss of substance, fractures and marginal degradation, reducing its longevity.²⁰

Beyond the technical care for the longevity of the restorations, it is important to reestablish the functional guide in the anterior region, if it does not exist, in order to contribute to the health of the stomatognathic system and the preservation of esthetic restorations. Therefore, increases were made in the palatal and incisal regions of elements 13 and 23, to define the angle of disocclusion and to establish the canine guide in laterality movements. Furthermore, the protusive guide of the incisors should also be well defined.¹⁹

After the restorative procedure, diamond drills for

finishing (Diamond (FMG®) associated with universal polishing paste (Maquira®) for polishing, were used to reproduce the anatomical characteristics, to reduce the roughness, resulting in a smooth and shiny surface. With optimum finish and polishing, it retains less biofilm and reduces the possibility of material's staining. Consequently, it contributes to tissue health, marginal integrity and longevity of restorations.²⁸

The use of elements such as photographs, study model, radiographs, diagnostic waxing, and silicone wall making, increase the predictability of the treatment to be performed, demonstrated in the present study. The correct diagnosis and planning are the main steps to perform a work of excellence, achieving an improvement in the patient's self-esteem and the durability of the procedure performed.^{29,30}

Conclusion

Dental anomalies in the anterior region of the maxilla can work as factors that affect the health of the stomatognathic system, besides compromising the esthetics and consequently the patient's self-esteem. The adhesive resto-rative technique using composite resins presents as an excellent alternative to re-anatomize of conoid teeth as the treatment is planned and executed in a detailed way.

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