

Diagnosis, oral rehabilitation and multidisciplinary approach of a patient with a severely worn dentition and reduced occlusal vertical dimension

Diagnóstico, reabilitação oral e abordagem multidisciplinar de um paciente com uma dentição gravemente desgastada e dimensão vertical oclusal reduzida

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ABSTRACT

Bruxism is a parafunction that presents as an involuntary and unconscious disorder of mandibular movement, characterized by flatness and grinding of the teeth. It is a hyperactivity of the masticatory muscles that is mainly associated with stress and emotion, and occurs in wakefulness and / or during sleep, without defined etiology and treatment, although there are etiological hypotheses with a strong implication in the central nervous system. The most common approach is to multidiscipline, in order to minimize etiological factors and restore lost function and esthetics. This case report describes the diagnosis, the associated treatments and the clinical follow-up of a patient with posterior teeth severely worn due to bruxism. Therefore, were made restoration of vertical dimension of occlusion with ceramic “table top” overlays in the posterior teeth and laminate veneers in the anterior teeth. Subsequently, cognitive/behavioral therapies and interocclusal devices were used.

Keywords: Bruxism, oral rehabilitation, dental aesthetics, muscle relaxation, occlusal splint, occlusal vertical dimension, occlusion, patient adaptation.

RESUMO

O bruxismo é uma parafunção que se apresenta como uma desordem involuntária e inconsciente do movimento mandibular, caracterizada pela planicidade e ranger dos dentes. É uma hiperatividade dos músculos mastigatórios que está principalmente associada ao stress e à emoção, e ocorre em vigília e/ou durante o sono, sem etiologia e tratamento definidos, embora existam hipóteses etiológicas com uma forte implicação no sistema nervoso central. A abordagem mais comum é a multidisciplinaridade, a fim de minimizar os factores etiológicos e restaurar a função e estética perdidas. Este relatório de caso descreve o diagnóstico, os tratamentos associados e o seguimento clínico de um paciente com dentes posteriores gravemente desgastados devido ao bruxismo. Assim, foi feita a restauração da dimensão vertical da oclusão com sobreposições de "mesa" de cerâmica nos dentes posteriores e facetas laminadas nos dentes anteriores.

Subsequentemente, foram utilizadas terapias cognitivas/comportamentais e dispositivos interocliais.

Palavras-chave: Bruxismo, reabilitação oral, estética dentária, relaxamento muscular, tala oclusal, dimensão vertical oclusal, oclusão, adaptação do paciente.

1 INTRODUCTION

Studies have shown a prevalence of sleep and awake bruxism in the adult population at approximately 8% and 20%, respectively, with a higher incidence at age 40.¹ Other studies have shown that 85% to 90% of the population may experience bruxism episodes throughout life.² The International Classification of Sleep Disorders (ICSD) defines it as a repetitive activity of the mandibular muscles characterized by the tightening or grinding of the teeth, or the pushing of the mandible.³⁻⁵ Currently, bruxism is no longer accepted as a single entity, but it is divided into two distinct manifestations: awake bruxism and sleep bruxism, based on when the activity occurs.^{4,6}

The causes of bruxism are still poorly understood. In the past, the predominant theory has considered that bruxism was caused by peripheral morphological changes such as malocclusion and defects in the anatomy of the orofacial region's bone structures.⁷ However, more recent studies have shown that occlusal and morphological changes are minimal in the etiology of bruxism. Thus, a second theory has emerged proposing that the causes of bruxism are related to central nervous system (CNS) dysfunctions.^{7,9} In any case, it seems evident that bruxism may have a multifactorial etiology and that other factors, such as psychosocial (stress), physiological (neurochemical and genetic) and exogenous factors (smoking) may contribute to the etiology of the disease.⁹

The signs and symptoms of bruxism are not always accompanied by painful disorders, as it is possible to find cases of extreme degrees of attrition where no type of pain is reported. In the other hand, it is possible to observe muscle hypertrophy, restorative and dental fractures, tooth wear, tooth sensitivity or pain, alteration of vertical dimension of occlusion and displacement of the disc of the temporomandibular joint.^{9,10} In cases of loss of vertical dimension of occlusion, it is relevant to use a removable occlusal device ("Table top"), device that needs minimal or none preparation of dental structure compared to conventional overlays, prior to irreversible treatment.¹¹

In view of the above, treatment requires a multidisciplinary approach in order to eliminate etiological factors and restore function and lost esthetics.¹² Thus, this case report describes the diagnosis, associated treatments and clinical follow-up of a patient with posterior teeth severely worn out due to bruxism. In order to do this, the posterior teeth received occlusal elevations made

with pieces in acrylic resin for patient's adaptation, also known as "table tops", followed by treatment with similar pieces in ceramic in posterior and anterior teeth, after reestablishment of vertical dimension of occlusion. In addition to the rehabilitation treatment, cognitive / behavioral therapies and the interocclusal device were used to control the parafunctional habits.

2 CLINICAL AND TECHNICAL PROCEDURES

Patient KP, female, 35 years old, lawyer, married, residing in Curitiba - PR, presented to the private clinic with accentuated wear on all dental elements and complaining about unsatisfactory dental aesthetics. She visited other dentist and was diagnosed with bruxism. During the anamnesis, she reported successive fractures in posterior teeth, difficulty in opening the mouth, pain in the masseter muscles' region, feeling of "tiredness", "tension", "pressure" or bilateral "tightening" at dawn, intensified in the late afternoon, migraine, signs of creased tongue and lesion marks on the cheeks, suggestive of dental tightening. In a previous attempt of treatment for bruxism, she had already used several types of devices, all of them fracturing with use.

The clinical examination (Fig 1) and radiographic examination (Fig 2) showed that despite the present losses, there was no alteration of the vertical dimension, only tooth wear, leading to pain reported by the patient. ODV was not present due to teeth extrusion, leading to periodontal surgery further described.

The treatment with a specialist in temporomandibular disorder occurred for 5 months, where the initial management was to treat the secondary headache attributed to temporomandibular disorders with intraoral devices (occlusal splint) and medications (cyclobenzaprine - myorelaxant 10 mg and nortriptyline - antidepressant 10 mg, for 60 days). This device was evaluated and adjusted weekly for neuromuscular balance, observed by similar occlusal contacts of the opposing teeth in the device using occlusal paper in centric occlusion and canine guidance in lateral movements. It's important to note that the treatment for temporomandibular disorder contributed to the occlusal stabilization and balance. After the obtained balance, the medication was replaced by Busparina - (buspirone anxiolytic 10mg) in the morning and maintained for another 60 days. There a no defined pharmacological protocol treatment for bruxism, but the treatment proposed was based on the symptoms reported by the patient.

With this, a comfortable occlusal position was obtained, which negated the pain previously reported. To avoid endodontic treatment due to dentin exposure caused by teeth waer and to improve teeth esthetics, it was necessary to increase the vertical dimension of occlusion in the posterior teeth by approximately 1mm (Fig 3 and 4), in order to open 2 to 3mm of space in the

anterior region (Fig 5). For this, a Jaw Interference Guide (JIG) was made in self-cured acrylic resin (Duralay, Reliance dental, color Red) (Fig 6), and the 2 mm increase was adjusted in the JIG until opposing teeth only had a single contact on it. Then, with the JIG in position and with addition silicon (Occlufast Rock, Zhermack; Express XT 3M ESPE), occlusal record and impression of both arches were taken.

Subsequently, plaster models were assembled in a semi-adjustable articulator (A7 PLUS, Bio-art, São Paulo-Brazil) and sent to the laboratory for waxing up (Fig 7) of both arches and making the temporary "Table Tops" or occlusal table in heat-cured acrylic resin (Duralay, Reliance dental, color 62) in the posterior teeth (Fig 8). These devices were used primarily to stabilize the occlusion and muscle position obtained with the occlusal splint. After mouth trial of the temporary "Table Tops", these were cleaned and prepared for cementation (Fig 9). Due to the presence of enamel on the central-occlusal surface and the need to remove the table tops later, the posterior teeth were etched with 37% phosphoric acid (Ultra Etch – Ultradent) in a small occlusal portion, followed by application of adhesive (Single Bond - 3M ESPE) and cementation with flowable resin (Filtek Z350 Flow, 3M ESPE, St. Paul, MN, USA) (Fig 10), due to its fine layer, granting a precise cementation without interference in the occlusion obtained. Then, occlusal inspection and adjustments were made prioritizing occlusal stability with most contact points on the centric holding cusps and well distributed, noted by regular points acquired with articulating paper (Accufilm 2, 40 micron) (Fig 11). Finishing and polishing were performed with rubber polishing tips (Jiff Polisher – Ultradent) (Fig 12). In the same session, even before gingivoplasty and preparation, the wax-up was used to make a mock-up in bisacrylic resin (Protemp 4, 3M ESPE) on the anterior teeth, in order to observe how much the patient adapted to the new shape of the teeth and to lighten the discrepancy in anterior teeth after posterior lift with Table Tops (Fig 13 and 14).

In the anterior section, a surgical guide for gingivoplasty based on diagnostic wax-up (Fig 15 to 17) with internal bevel was designed and used. After 15 days, sutures were removed and the anterior and posterior teeth were again etched with 37% phosphoric acid (Ultra Etch – Ultradent) in a small vestibular portion, followed by application of the adhesive (Single Bond - 3M ESPE) and the application of the mock-up with bisacrylic resin (Protemp 4, 3M ESPE). The patient was then asked to return after 2 months to fulfill the healing period.

In the return appointment, occlusal stability and absence of pain were observed, but with gingivitis, being necessary to reorient the patient to correct brushing along with the use of chlorhexidine mouthwash. Thus, the Mock-up was removed, followed by prophylaxis and 7 days

were waited for the disease's regression. Then, with horizontal and vertical guides (Fig 18) minimally invasive preparation in enamel were performed (Figure 19), impressions were made with addition silicone (Express XT, 3M ESPE) and sent to the laboratory to the manufacture of Feldspathic ceramics (IPS Design Ivoclar Vivadent, Schaan, Lichstetein) in the anterior teeth and Pressed Lithium Dissilicate (E-max Ceram, Ivoclar Vivadent, Schaan, Lichstetein) in the posterior ones, both were fabricated according to manufacturer's recommendation. Both materials were chosen according to their properties related to the teeth and function they would reproduce. Anterior feldspathics veneers granted an excellent aesthetics result, relying on the technician abilities and pressed ceramic restoration are highly recommended due to their high resistance even before cementation, making it easier to handle and manufacture.^{29,35}

The last visit was for final cementation of the pieces (Fig 20 to 22), following the same protocol for each of them: etching of the internal surface of the ceramic pieces with 10% hydrofluoric acid (Condac, FGM Produtos Odontológicos, Joiville, SC, Brazil) for 60 seconds on the lithium dissilicate pressed pieces and for two minutes on the feldspatic, the pieces were washed for the same period, respectively, and then were air dried. Silane agent was applied for one minute followed by adhesive system (Single Bond Universal adhesive, 3M / ESPE). The second step was air jetting with aluminum oxide (Bioart – 50 micron) and acid etching of the dental surface, with 37% phosphoric acid (Kerr Gel Etchant, Kerr) for 30 seconds, then washed with water for the same time and the conventional adhesive system (Single Bond - 3M / ESPE) was applied. For the cementation of the pieces, Rely-X Veneer (3M ESPE) light cured resin cement was used, the pieces were filled with cement and taken into position, the excesses were removed and photoactivated was used for one minute on all the faces of the teeth.

After cementation of the veneers, an occlusal adjustment was performed using articulating paper and finishing tips, in which the patient was asked to perform lateral and protrusion movements so that the points of greatest contact were observed, and the occlusion and the guides could be well adjusted.

Acrylic dental guard was designed in the maxilla (Michigan splint or interocclusal device) not only to reduce teeth grinding and muscle tension but also to protect recently installed veneers and table tops. Behavioral therapy (pilates classes) was proposed to stabilize parafunctional habits and avoid the consequences of such habits. The patient was oriented to avoid bruxism risk factors such as drugs, alcohol, emotional stressing, cafein based foods and beverage, teeth grinding, and to start relaxation techniques and sleep hygiene. It was also suggested to the patient to start Global Postural Reeducation as a method to reduce pain. Pilates classes were suggested also, as postural

reeducation and as an stress reliever as some studies claim that the position of the head and cervical spine affects the positioning of the jaw, and consequently these changes may be associated with craniomandibular pain^{13,14,15}

After two years, the patient was asked to return to the office for evaluation. She remained with behavioral therapy and the use of the interocclusal device, as well as the absence of algias and preserved ceramic restorations in the intraoral evaluation (Fig 23). Furthermore, in Figure 24 it's possible to see the color stability and integrity of the veneers after five years.

2 DISCUSSION

Given the current multifactorial etiological paradigm that characterizes bruxism, there is no therapeutic approach with full efficacy in the signs and symptoms caused by it. The current treatment is based on minimizing the symptoms and the consequences that this parafunction has on the stomatognathic system and on the patients' oral rehabilitations. This may be multidisciplinary, and may include behavioral treatment, dental and pharmacological treatment.¹⁰

Available treatment approaches report various levels of efficacy on the detrimental consequences of bruxism.^{4,16} Bruxism can be managed by strategic behaviors, which include avoiding risk factors and triggers such as: cigarette, alcohol, caffeine, drugs, and patient re-education such as: control of oral parafunction during wakefulness, relaxation techniques, sleep hygiene, biofeedback, and cognitive-behavioral therapy.^{4,17}

Therapies with Biofeedback have presented positive results for the treatment of bruxism. This device aims to raise awareness and educate the user to relax certain muscles.¹⁸ It is important to mention that these devices and applications, with the function of biofeedback are already being marketed. Among them there is GrindCare,² BiteStrip¹⁶ and Apple¹⁷ app that can be used.

Several drugs promote the decrease or increase in the activity of bruxism, supporting a probability of involvement of focused mechanisms without triggering sleep bruxism.^{9,18} According to experimental studies, an oral motor activity can be influenced by the administration of agonists of the dopamine receptor. Since dopaminergic antagonists are drugs that block dopamine receptors in the brain and dopaminergic agonists, these drugs may induce or suppress bruxism because of its side effects.⁹ There is still a lack of evidence regarding the efficacy and safety of bruxism medications. Therefore, pharmacological treatments should be considered only in severely affected symptomatic patients and only as short-term therapy.⁴

Regarding the occlusal vertical dimension (OVD) for dentate individuals, it is mainly determined by the remaining dentition, so the loss of dental substrate can influence the OVD,

leading to changes in facial morphology, function, comfort and esthetics.¹¹ Although loss of OVD is clinically possible, the original OVD can be maintained by a dentoalveolar compensatory mechanism. This stomatognathic system's function is considered by authors as a mechanism of adaptation in response to the progressive loss in dental substance.¹¹

However, for the generalized loss of crown height due to dental wear, from the clinical perspective, it is beneficial to consider the increase of OVD, as it will provide space for restorative material, favor the teeth's aesthetics, correct the anterior dental relationship, allow the reestablishment of occlusion and minimize the need of invasive clinical procedures such as: prosthetics crowns and endodontic treatments.^{11,22} Several authors have mentioned the method of increasing OVD to facilitate restorative treatment and improve aesthetics.^{23,24} These advantages are even more evident for a dentition suffering from dental wear.¹¹

Alternatively, there are two types of occlusal approach: "reversible" and "irreversible."¹⁰ The "irreversible" subdivision includes permanent occlusal methods (dental and prosthetic restorations), needed by at least 25% of elderly, on the other hand, the reversible occlusal approach is the most commonly used approach, which consists in the use of removable occlusal "table top" devices placed between the jaws temporarily.²⁶ However, this device may minimize damage caused by grinding teeth, but it will not eliminate bruxism.^{10,28}

Experimental studies report that the removable "table top" occlusal splint is temporarily cemented into one of the arches (which can cover completely or partially the arch) to ensure absence of painful symptomatology for subsequent definitive restoration.¹¹ This device promotes an orthopedically more stable joint position, redistributes occlusal forces, and protects teeth and supporting structures preventing tooth wear and mobility. They reduce the characteristic noise of teeth grinding, orofacial pain and even reduce the abnormal muscle activity associated with bruxism by allowing the reorganization of neuromuscular activity.^{23,24}

Several aesthetic treatments focused on the dental element (white aesthetics) have already been diffused in the Restorative Dentistry with emphasis on whitening, veneers and ceramic crowns.^{28,29} However, treatments directed to white aesthetics are not able to promote the harmony of the desired smile, and periodontal procedures (red esthetics) are necessary to achieve a more pleasant smile.³⁰⁻³² Among the various periodontal surgical modalities, clinical crown lengthening procedures, which consist of the removal of gingival tissue with or without bone removal, are considered to be relevant therapeutic approaches, both for biological space restoration in cases of caries or fractures, and for excess of gingival tissue corrections or "gingival smile".³³

Dental ceramics have been evolving over the years and are considered as an excellent alternative for "definitive" rehabilitation treatment.³⁴ Ceramics have been considered as the ideal material for anterior teeth restorations due to their physical, biological and optical properties. These properties allow ceramics to maintain the color of the restoration over time, as well as provide resistance to abrasion, allowing great stability in the oral environment, high biocompatibility and natural appearance in terms of translucency, luminosity and fluorescence.³⁵

Interocclusal devices are also referred to as stabilizing splints, Michigan splints, Tanner splints, Fox splints, and centric splints.³⁶ With the primary goal of providing ideal occlusion, positioning the condyles in a centric position, to relax the masticatory muscles and to prevent tooth wear at the expense of parafunctional activity.³⁷ It has been scientifically proven that interocclusal devices are effective in preventing tooth wear, but there is no evidence to support their role in disrupting bruxism.^{4,10}

4 CONCLUSION

- Rehabilitation of patients who have worn teeth by bruxism is still a challenge. However, multidisciplinary approaches, including behavioral, dental and pharmacological treatments, are currently used.

- The method used to restore the vertical dimension of occlusion proved effective in making use of temporary table tops for further rehabilitation with definitive ceramics pieces, thus restoring function and lost esthetics.

- However, further studies should be performed to better understand the etiology and treatment of bruxism.

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FIGURES

Fig 1a. Initial appearance of the smile in occlusion.



Fig 1b. Initial aspect of the patient face.



Fig 2. Lateral radiographs of ATM.

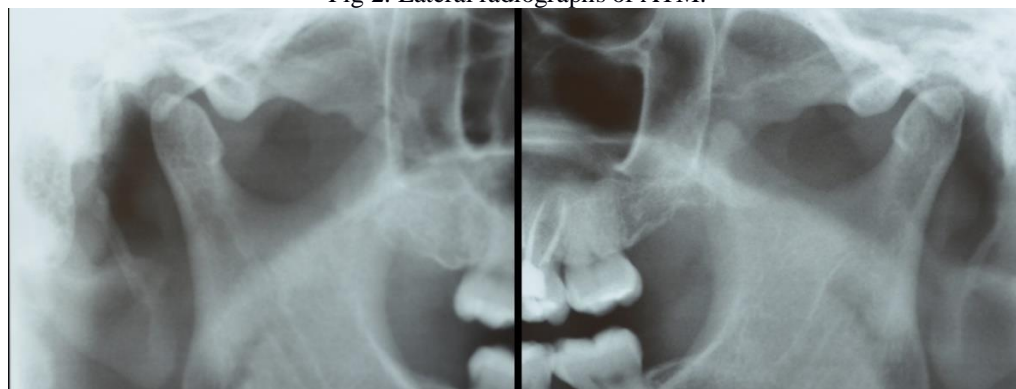


Fig 3. Marked contact with articulating paper on the mesiobuccal tooth apex 36.



Fig 4. Less intense contact marked with articulating paper on the mesiobuccal cusp of the tooth 36, after increasing the cusp of the tooth 46 by 1 mm.



Fig 5. Photographs before and after posterior occlusal increase by 1 mm.



Fig 6. Preparation of Jaw Interference Guide (jig) in acrylic resin on the anterior teeth for transference of the record to semi-adjustable articulator.



Fig 7. Right, front and left side view of the wax up of the upper and lower arch in occlusion.



Fig 8. Occlusal view of Table tops made of acrylic resin in the inferior arch on cast model and occlusal adjustment after occlusal test on the patient's teeth.

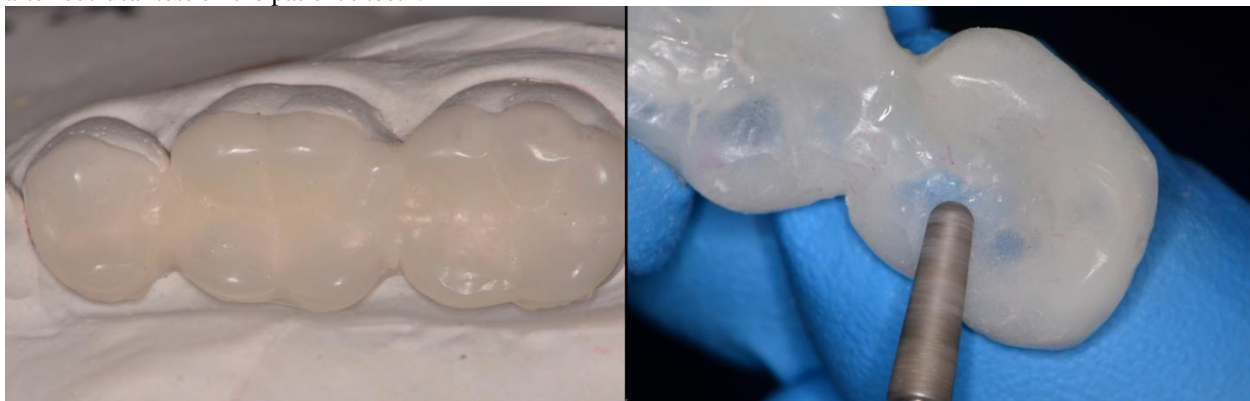


Fig 9. Application of adhesive system on the inner surface of the table tops and light protection with orange box to wait the positioning moment in the postero-inferior teeth.



Fig 10. Enamel etching of the center of occlusal region, to facilitate removal for cementation of the definitive pieces. Internal filling of the table tops with flowable resin and positioning on the teeth's occlusal surface. The silicon tip of the SMART (FGM) was used to aid in the correct flow of the cement and removal of internal bubbles, with subsequent photoactivation.

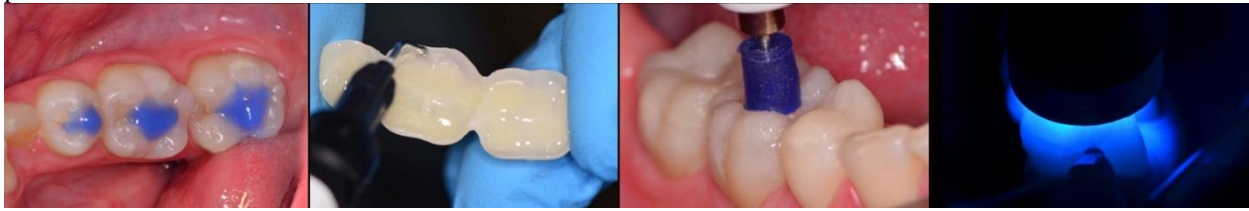


Fig 11. Visualization of the contacts established in maximum habitual intercuspation and laterality with the aid of articulating paper for posterior occlusal adjustment.

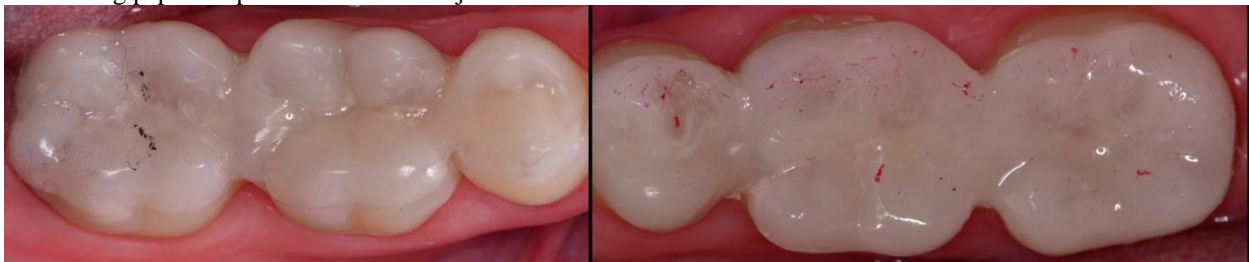


Fig 12. Finishing and polishing using abrasive rubbers tips and visualization of contacts established after occlusal adjustment.



Fig 13. Acid etching at a more central point of the anterior upper teeth and application of adhesive systems in this area, for greater retention of the bisacrylic resin mock-up.



Fig 14. Mock-up with bisacrylic resin (Protemp 4, 3M ESPE) made from wax up and silicone guide (Zetalabor – Zhermack).



Fig 15. Surgical guide made from the wax up with bisacrylic resin to assist the delimitation of gingivoplasty.



Fig 16. Gengivoplasty respecting the delimitation of biological space.



Fig 17. Suture and surgical guide test to check if it was consistent with the planning.



Fig 18. Horizontal and vertical guides to assist in the minimally invasive veneer preparations in the anterior upper teeth.

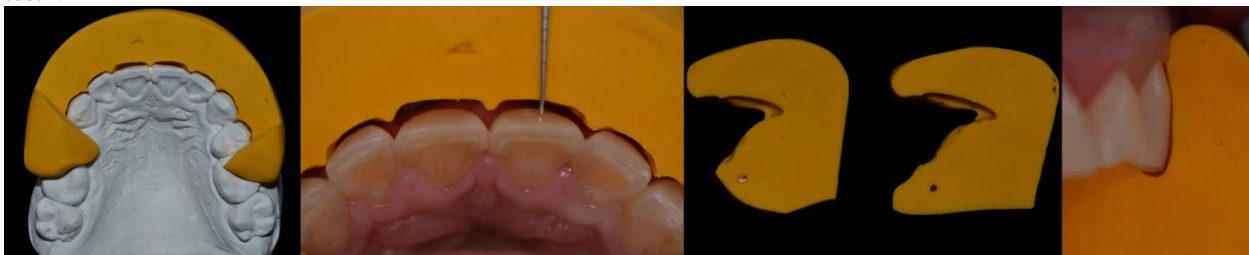


Fig 19. Visualization of the minimally invasive preparations in the anterior upper teeth.



Fig 20. Surface treatment of metal-free crowns to be cemented in the posterior upper teeth.



Fig 21. Cemented veneers in anterior upper teeth, definitive table tops in the posterior lower teeth and metal-free crowns in the posterior upper teeth.



Fig 22. Cemented table tops on posterior teeth.



Fig 23. Clinical aspect after two years.



Fig 24. Five-year follow-up.

