

Clinical case

Complete Oral Rehabilitation of a Patient with Class II Malocclusion: A Case Report

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ABSTRACT

Introduction: The increase in overjet and overbite in a patient with class II malocclusion can affect the aesthetic and functional result of prosthetic treatment. **Objective:** To describe a complete oral rehabilitation through aesthetic and radiographic analysis; wax-up and mock-up; surgical conditioning of the oral cavity to receive implants and final restorations; rehabilitation of implants with fixed prostheses and individual crowns in the posterior sector and crowns and veneers in the anterior region, to restore aesthetics and function. **Case presentation:** Angle's class II

patient with periodontal disease and bruxism. Phase I: Extraction and alveolar ridge preservation (26, 47); interdental bone regeneration (31, 32); implant placement (36, 46); maxillary sinus lifts and implant placement (14, 16, 24, 26). Phase II: Preparation for a fixed prosthesis (11-13) and individual crowns (21, 22, 23) of lithium disilicate (LS₂), acrylic provisional (Alike™, GC® America Inc) with a metallic framework (18, 28) and crown lengthening in upper anterior sextant. Preparation of margins at the equigingival level and change of provisional. Lower anterior sextant preparation for LS₂ veneers and provisional placement (Protemp™, 3M™). Final impression with silicone (3M™ Imprint II™, 3M™) and individual trays. Phase III: Cementation (Panavia™ V5 Clear kit, Kuraray) of LS₂ restorations. Placement of metal-ceramic cemented fixed prostheses on upper implants and single metal-ceramic, cement-screwed crowns on lower implants. Extraction (18, 28). Finally, an occlusal splint with anterior guides was placed. Phase IV: Maintenance and periodic evaluation. A treatment plan was established in conjunction with periodontics to achieve the expected results; Surgical procedures allowed better adaptation of final restorations, and function and aesthetics were restored, thus reducing overjet, replacing missing teeth, and harmonizing the smile. **Conclusions:** It is essential to establish a treatment plan focused on correcting the alterations caused by a class II malocclusion in accordance with the needs of the patient.

Keywords: Complete oral rehabilitation; class II malocclusion; horizontal overbite; vertical dimension; shortened arch.

INTRODUCTION

In complete oral rehabilitation, it is essential to consider the relationship between the maxilla and the mandible, as it impacts occlusion, esthetics, and treatment results. For this reason, we have used classification by Edward Angle since 1899. He suggested that normal occlusion was based fundamentally on the intercuspation of the first permanent molars depending on the anteroposterior mandibular relationship. In a normal class I occlusion there is a normal mesiodistal arch relationship, in class II the mandibular first molar is in a distal position to the maxillary first molar, and in class III, the mandibular molar is in a mesial position to the maxillary first molar^{1,2}. Patients with class II malocclusion commonly present an overbite and overjet that compromises the esthetics and function, which affects their quality of life^{3,4}.

The orthodontic treatment need index (OTI), which defines the severity of the malocclusion and the priority of treatment, considers overjet as the second worst type of malocclusion. Orthodontic intervention in these cases is always best at an early age. However, evaluation differs among practitioners, and not all patients can receive appropriate and timely orthodontic intervention. As the demand for esthetics and function increases with age, patients seek to correct tooth malposition as adults. If the malocclusion is not severe, to minimize time and cost a prosthetic approach can be proposed to correct overjet and overbite by replacing natural crowns with prostheses with good angulation⁵. In cases of more severe overjet, interdisciplinary treatment with orthognathic surgery, orthodontics, and/or complex oral restoration is required to restore occlusion and create favorable facial and dental esthetics^{6,7}.

The goal of modern esthetic prosthodontics is to harmonize white and pink esthetics. The term white esthetics refers to the visual replication of the natural dentition and pink esthetics, refers to the surrounding gingival architecture accompanied by health and esthetic characteristics. It is

essential to establish functional goals and esthetics by systematically analyzing and previewing restorations through diagnostic wax-up and periodontal therapy for soft tissue management^{8,9}. The following is an Angle class II clinical case, with localized stage IV grade C periodontitis¹⁰ and bruxism reported by the patient, where a complete oral rehabilitation with fixed prosthesis, single crowns, and veneers was performed to restore esthetics and function.

CLINICAL CASE PRESENTATION

A 38-year-old female patient presented with the following reason for consultation: *"I want to replace my missing teeth because it is hard for me to eat"*. As for dental history, she reported that she had had dental extractions for periodontal disease, direct restorations, and removable prostheses.

The extraoral analysis of the patient showed a dolichocephalic facial biotype, the facial midline showed harmony, and the interpupillary line was parallel to the inter commissural line. The facial midline was almost coincidental with the dental midline, as well as the interpupillary and incisal lines. The facial thirds were symmetrical, within normal parameters, and balanced with each other. The analysis of esthetic parameters (Table 1) was performed on profile photographs. In the smile analysis, the patient presented medium and wide lip dynamics, in which the incisal edge was positioned over the lower lip and made evident the multiple dental absences and wide buccal corridors (Figure 1. A).

Table 1.
Aesthetic parameters analysis

Measurement	Value	Standard
Profile	171°	170°
Nasolabial angle	90°	100° a 105°
E Line	Behind	Lips behind line E
Upper lip length	22 mm	20-22 mm
Dental exposure at rest	1.58 mm	1.58 mm
Lower lip curvature	Does not match	Must coincide with dental curvature
Facial and dental midline	Deviation of the lower dental midline 4 mm to the right	Coincident

In the intraoral analysis, both arches showed a square shape and discontinuous processes, and a wide band of generalized keratinized gingiva was observed in all the sextants. In the upper arch, there was an absence of multiple teeth, root exposure, and dental malposition; a generalized loss of dental substance was observed in the incisal edges, accentuated in the central incisors, which were extruded. There were occlusal caries and a previous amalgam restoration in the molar area (Figure 1. B). Radiographically there was loss of bone support in the left molars, absence of several teeth in the posterior sector, root exposure in premolars on both sides, and malposition of the molar; the incisors showed wear in the incisal edges, as well as black interproximal triangles. Additionally, there was a vertical bone defect between teeth 31 and 32, permeability of the maxillary sinuses; the right upper alveolar process was in close contact with the maxillary sinus, and the path of the inferior dental nerve (Figure 1. B-C).

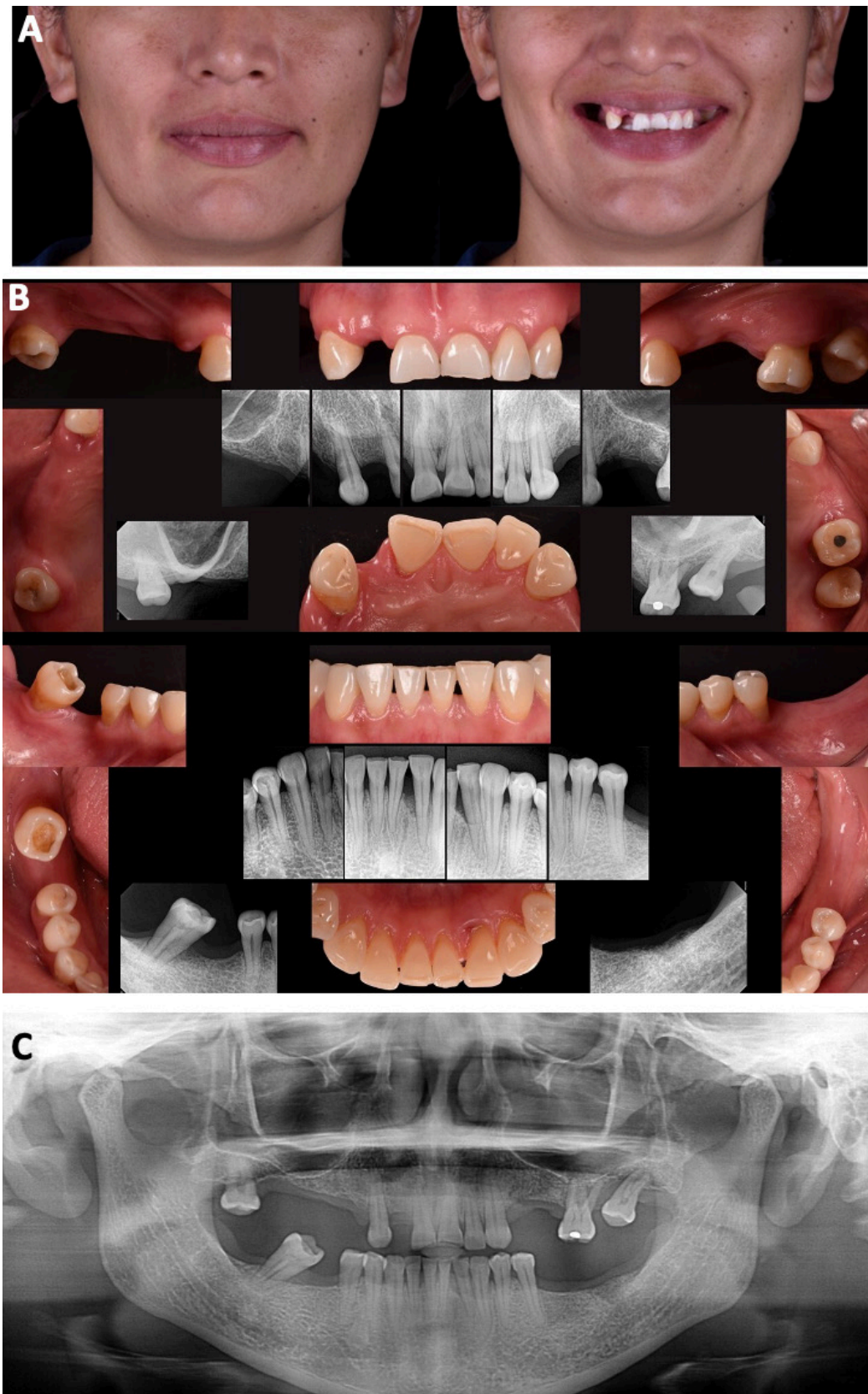


Figure 1. Initial studies. A. Frontal and smile extraoral photographs. B. Upper arch radiographs and photographs and lower arch radiographs and photographs. C. Orthopantomography.

The occlusal analysis showed an overjet of 5mm at maximum intercuspation (Figure 2.B) and 8mm in centric relation (Figure 2. C), the discrepancy between maximum intercuspation and centric relation was 3mm, overbite was 3mm (Figure 2. C) and there was an interocclusal clearance of 5mm. The objective of treatment was to attain a complete oral rehabilitation through esthetic and radiographic analysis, wax-up, *mock-up* and pre-prosthetic surgical interventions to condition the oral cavity to receive the implants and final restorations.

Once the diagnostic elements (study models, radiographs, and intraoral and extraoral photographs) were obtained, the corresponding analyses were performed and a diagnostic wax-up was prepared with the models articulated in centric relation. Before the periodontal intervention, a *mock-up* (Protemp™, 3M™) was prepared from the diagnostic wax-up to establish the desired dental proportions and gingival contours (Figure 2. D); in this way, it was possible to establish communication with the periodontist and to have the final treatment objectives in common. The treatment was done in four phases:

In **Phase I**, teeth #26 and 47 were extracted, as their periodontal prognosis was hopeless. It was decided to temporarily keep the upper third molars to use them as abutments for the provisional crowns. Teeth #31 and 32 had a fair and poor periodontal prognosis respectively, so it was decided to perform bone regeneration in the interdental area. Implants were placed in teeth 36, and 46, the elevation of both maxillary sinuses was performed and implants were placed in teeth 14 and 16. In **Phase II**, the upper teeth #13, 11, 21, 22, and 23 were prepared; it was also decided to prepare and temporarily maintain the third molars 18 and 28 to support a

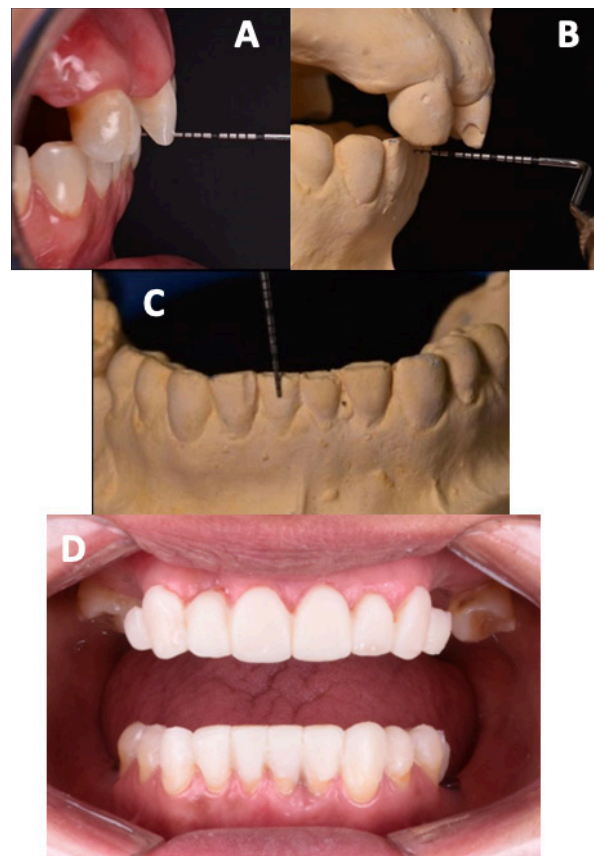


Figure 2 Overjet and overbite analysis, mock-up, and acrylic provisional. A. Overjet in maximum intercuspitation. B. Overjet in centric relation. C. Overbite. D. Mock-up test.

provisional acrylic crown (Alike™, GC® America Inc) sectioned in hemi-arch from central to third molar, with a metal framework reinforcement (Figure 3. A). It was done this way due to the long healing periods that would occur during the treatment, to avoid fractures due to the length of the edentulous gaps, and to maintain vertical dimension. Crown lengthening was performed on teeth #13, 11, 21, 22, and 23 (Figure 3. B). One month later the teeth were re-prepared to place the margin at the equigingival level. An impression was taken with alginate (Hydrogum 5, Zhermack® Dental) to make a new wax-up and a new acrylic provisional crown using the same metal framework as the previous provisional (Figure 3. C). In the lower arch, horizontal veneer preparations were made on teeth 31, 32, 33, 41, 42, and 43 to restore the lost tooth tissue and achieve contact with the upper teeth. A bis-acrylic resin provisional (Protemp™, 3M™) was placed

In **Phase III**, final impressions were taken with vinyl polysiloxane silicone (VPS) in heavy and light cartridges (3M™ Imprint™ II, 3M™) to obtain the working models and fabricate the final restorations. For the upper anterior sextant, single-layered LS₂ crowns (IPS e.max® Press, Ivoclar Vivadent®) were fabricated on teeth #21, 22, and 23, and a three-unit layered LS₂ fixed prosthesis (IPS e.max®, Ivoclar Vivadent®) on abutments 11 and 13. LS₂ veneers (IPS e.max® Press, Ivoclar Vivadent®) were fabricated for the lower anterior sextant. Two screw-cemented metal-ceramic single crowns (Vitavm®, Vita) were made for implants placed in teeth #36 and 46; a three-unit fixed prosthesis for implants was placed in the upper arch 14, 16, and another three-unit fixed prosthesis for implants 24 and 26, both fixed prostheses were metal-ceramic (Vitavm®, Vita). The fixed prostheses on implants were cemented due to the angulation of the implants.

Cementation was performed with an absolute isolation technique, metal-free restorations were conditioned with hydrofluoric acid (Porcelain Etch 9%, Ultradent™) for 20s, rinsed, 37% phosphoric acid (K-Etchant Syringe, Kuraray Noritake Dental Inc) with 20s of friction to remove

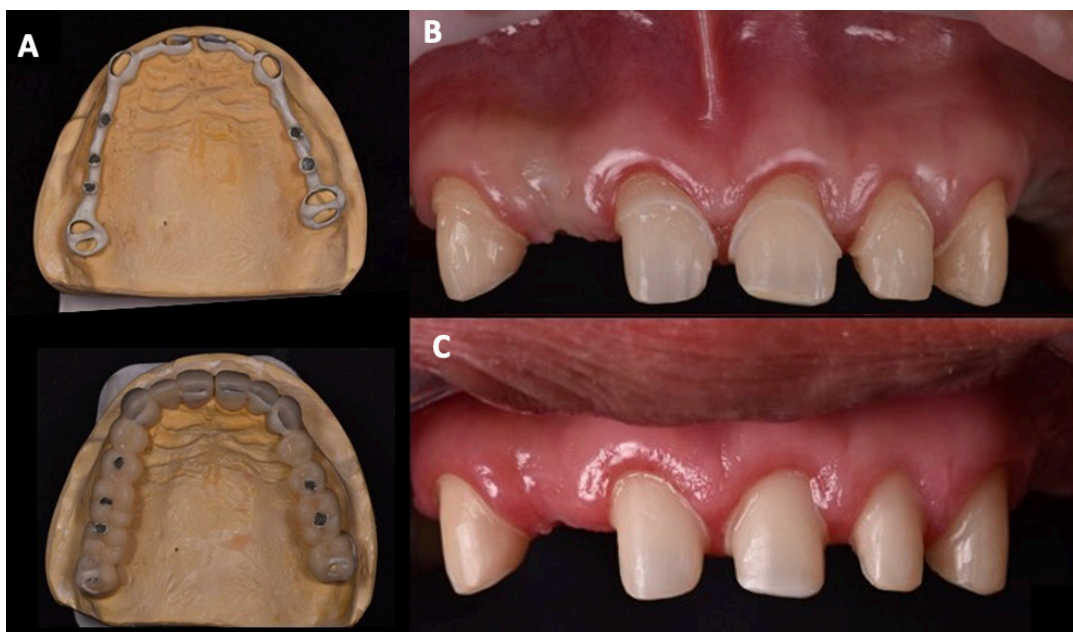


Figure 3. Acrylic provisional crown and tooth preparation. A. Metal framework reinforcement of acrylic temporary. B. Teeth before gingival margin preparation. C. Equigingival margins three months after crown lengthening.

residues, followed by 20s rinsing, drying and application of ceramic primer (Clearfil™ Ceramic Primer Plus, Kuraray Noritake Dental Inc). The primer was left to dry for 60 seconds. For tooth conditioning, the surface was sandblasted with 30µm aluminum oxide, rinsed, the enamel was etched with 37% phosphoric acid (K-Etchant Syringe, Kuraray Noritake Dental Inc) for 15s, rinsed and Tooth Primer (Panavia™ V5 Clear, Kuraray Noritake Dental Inc) was applied. Crowns (#21, 22, and 23), fixed prosthesis (#11 and 13) and veneers (#31, 32, 33, 41, 42 and 43) of LS₂ were cemented with dual cement (Panavia™ V5 Clear, Kuraray Noritake Dental Inc). Implant-supported fixed prostheses (#14, 16, 24, and 26) were cemented with dual cement (Panavia™ V5 opaque, Kuraray Noritake Dental Inc) using thread to avoid subgingival cement debris. The implant-supported crowns (#36 and 46) were screw-retained at 35Nc. Figure 4. A shows the final restorations in the mouth in the upper arch and Figure 4. B shows the lower arch. Finally, the occlusion was assessed with articulating paper, premature contacts were eliminated and an occlusal splint with anterior guides was provided. Figure 4. C shows the photographs of the patient with the final treatment results. In **phase IV**, the patient was scheduled for evaluation and will require periodic check-ups for prosthesis maintenance.

As a result, a complete oral rehabilitation of the patient in Angle class II was achieved through pre-prosthetic surgical procedures (bone regeneration, sinus elevations, implant placement, and crown lengthening) that allowed conditioning the oral cavity to receive the final restorations (fixed prosthesis, crowns, veneers, fixed prosthesis on implants and individual crowns on implants) maintaining the vertical dimension and with an adequate adaptation to the gingival tissues. The overjet was reduced by correcting the axial angulation of the anterior teeth using restorations (fixed prosthesis, crowns, and veneers), and occlusal contact between the upper anterior and lower anterior teeth was achieved. The black triangles (interdental spaces) in the lower anterior sextant were also closed when veneers were placed. A stable

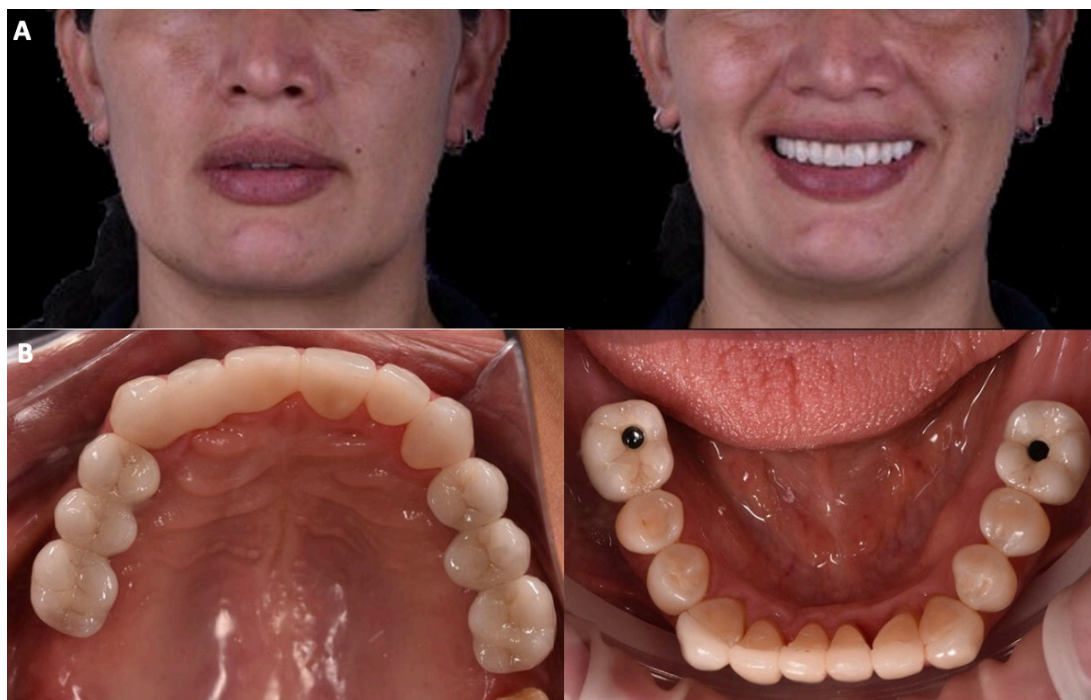


Figure 4. Final photographs. A. Extraoral frontal and smile photographs. B. Upper and lower intraoral photographs.

shortened-arch occlusion in centric relation was established when placing the prostheses on implants. Therefore, it can be said that the functional, esthetic, and biological objectives were achieved according to the patient's expectations.

DISCUSSION

Ruf *et al.*¹¹ mention that class II malocclusion can cause alterations in mastication, swallowing, speech, and breathing, with a greater predisposition to periodontal disease and to suffer damage to the temporomandibular joint and masticatory muscles. Therefore, considering the possible consequences of the malocclusion, treatment alternatives were presented to the patient that fulfilled the objective of correcting Angle's class II. Al-Jasser¹² states that overjet and overbite affect periodontal health, indicating that periodontal treatment may be insufficient unless these malocclusions are corrected. We agree with Al-Jasser¹² since in our patient's periodontal disease was one of the main causes of tooth loss and it was necessary to correct the class II malocclusion to prevent periodontal disease from continuing to affect the remaining teeth.

Sierwald *et al.*¹³ report that when a malocclusion is related to the anterior teeth it has a psychological effect on the patient's well-being. An increase or decrease in the overjet value is associated with aesthetic deficiencies in oral health related to the patient's quality of life¹³. This is clinically relevant. Our patient reported dissatisfaction with her appearance due to the position of her anterior teeth, so one of the treatment objectives was to decrease the overjet by changing the angulation of the anterior teeth with ceramic restorations to provide better esthetics as much as possible. Reports in the literature mention that an increase in the overjet can influence the characteristics of the facial soft tissues, generating an impact on facial appearance and smile^{14,15}. Therefore, in our patient, an analysis of the esthetic parameters was performed to observe possible facial discrepancies. In particular, an increase in the overjet has been shown to influence the position of the upper lip and the dimension of the lower facial third, respectively.

After the clinical history and esthetic analysis, the diagnosis was made based on the extraoral and intraoral characteristics of the patient using diagnostic instruments to consolidate an appropriate treatment plan. This involves knowing the state of dental health and the surrounding structures; the prognosis and periodontal diagnosis and the severity of the case in terms of prosthodontic diagnosis^{16,17}. The patient presented disharmony of the smile and apparent short upper anterior teeth due to wear on incisal edges, so other esthetic parameters were considered, such as dental proportions and gingival characteristics to compensate for the esthetic disharmony^{18,19}. Alfallaj²⁰ mentions that the situation of incisal wear is complicated in the presence of bruxism, causing a compensatory eruption that results in short clinical crowns, suggesting different approaches in this type of situation and among them is the crown lengthening procedure, which is applied to correct the discrepancy in the gingival margins and achieve better retention of future restorations. Due to the aforementioned reasons and because of the age of the patient it was decided to perform the treatment in conjunction with periodontics.

We agree in considering the method of treatment of worn dentition suggested by Koubi S *et al.*²¹; therefore, before proceeding with the surgical-prosthetic intervention, a diagnostic wax-up was performed to establish the gingival margins of the future restorations, to compensate and correct the dental position, as well as to preview the teeth to be replaced to indicate to the periodontist the final objective of the rehabilitation and perform the necessary surgical treatments. Yu *et al.*²² report that currently the method used in esthetic restorations is to

remove a certain amount of dental tissue preserving it as much as possible to be replaced with ceramic restorations, including porcelain veneers, and porcelain crowns, among others²². Therefore, we decided to place LS₂ ceramic restorations in upper and lower teeth preserving as much dental tissue as possible.

Khan *et al.*²³ mention that the shortened arch treatment option is encouraging in terms of functionality, patient satisfaction, and cost-benefit ratio and recommend implementing this type of treatment in partially edentulous patients. For this reason, fixed prostheses and crowns were placed on implants up to the first molar area to achieve a shortened arch occlusion and thus restore the patient's function.

CONCLUSIONS

It is essential to establish a treatment plan focused on correcting the alterations caused by a class II malocclusion according to the patient's needs. A good diagnosis is required to obtain a treatment plan that restores the patient's oral health, restores function, and improves esthetics. If the clinical disciplines involved have the same treatment objectives in mind, more favorable results will be obtained.

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