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CASE REPORT

Orthodontic and periodontal treatment in generalized stage IV periodontitis: A case report.

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Keywords: Periodontitis; orthodontics; malocclusion; bone resorption; interdisciplinary treatment; tongue habits.

ABSTRACT

Background: Periodontitis is an inflammatory disease of bacterial origin and complex etiology that triggers a destructive immune-inflammatory response on the dental support structures. Among its most relevant clinical consequences, particularly when associated with posterior tooth loss, are occlusal collapse, decreased vertical dimension, proclination, diastemas, and extrusion, situations that often require orthodontic intervention to restore the functional stability of the masticatory system.
Case description: This clinical case presents the diagnosis and orthoperiodontal treatment of a systemically healthy patient with stage IV periodontitis, generalized grade C, skeletal class I, maxillary and mandibular prognathism, hypodivergent pattern, microgenia, dental protrusion and proinclination, and bimaxillary anterior lingual thrust.
Clinical findings: The therapeutic approach was aimed at improving gingival health, facial aesthetics, and occlusal function by correcting tooth position, closing spaces, improving arch form, and muscle re-education to correct dysfunctional tongue patterns in order to maintain a stable and functional bite and long-term stability, combining biological, functional, and aesthetic principles in a personalized treatment plan.
Treatment: The treatment was carried out in three phases. First, periodontal therapy included risk factor control, oral hygiene education, scaling and root planing, gingivectomy, and speech therapy to control tongue thrusting, achieving periodontal improvement. Then, in the orthodontic phase, the MBT technique was applied with 0.022" slot brackets, using light and continuous forces together with sliding mechanics, complemented by periodontal maintenance at each check-up.
Result/Outcome: Facial profile improvement, stable occlusion through correction of anterior crossbite, normalization of tooth inclinations, elimination of occlusal trauma and closure of interdental spaces, anterior guidance, stable posterior occlusion, and adequate force distribution were achieved, significantly improving both masticatory function and facial aesthetics, which had a positive impact on the patient's self-esteem. The ortho-periodontal approach with gentle forces is key to preserving bone support, highlighting the importance of biofilm control, oral hygiene, and tongue re-education for stability and relapse prevention.

CLINICAL RELEVANCE

Orthodontic-periodontal management is key in patients with advanced periodontitis and pathological tooth migration. This case highlights: (1) the need for periodontal control prior to tooth movement, (2) the use of light orthodontic forces to preserve remaining bone, and (3) tongue re-education for occlusal stability. Controlled forces, together with plaque and habit management, allow for the stabilization of teeth with a reserved prognosis, improving function and aesthetics. Interdisciplinary follow-up and periodic periodontal maintenance are essential for lasting results.

Periodontitis is considered a chronic immune-inflammatory disease characterized by the accumulation of biofilm in the gingival sulcus with progression and damage to connective tissue and alveolar bone. This is caused by a hyperinflammatory response of the host to bacterial dysbiosis. Systemic, behavioral, genetic, epigenetic, and environmental risk factors can modify the immune-inflammatory response, resulting in more severe periodontal destruction. Additionally, local risk factors influence the prognosis of periodontally affected teeth. [1] Risk factors predisposing to the development of periodontal disease can be modifiable, such as smoking, oral hygiene, and adherence to periodontal treatment; and non-modifiable, such as genetic predispositions, systemic pathologies such as diabetes mellitus, immunosuppressed patients, and age, where the tissue response is slower.[2]

Periodontal complications and tooth loss can lead to bite collapse, decreased vertical dimension, anterior tooth proinclination, pathological tooth migration, and excessive eruption of the anterior teeth. Changes in tooth position can complicate plaque control, traumatize the periodontium, and lead to unsatisfactory aesthetics and function.[1]

Oral habits, such as anterior tongue thrusting, have significant harmful implications for the patient. The loss of anterior teeth has a multifactorial origin ranging from trauma, periodontal disease, dental caries, and persistent oral habits. If preventive treatment is not provided at an early age, these habits continue into adulthood. The altered balance between tongue force and oral musculature leads to anterior migration of the teeth, which are highly susceptible to traumatic damage, and the absence of anterior guidance prolongs the time of disocclusion, predisposing patients to temporomandibular disorders.[3]

Periodontal therapy allows for the alteration of modifiable risk factors and the control of non-modifiable factors to halt the progression of the disease and restore those areas of the supporting apparatus that have been destroyed by the disease.[4] Orthodontic forces are a physical agent capable of inducing an inflammatory reaction in the periodontium, which is necessary to generate tooth movement. One of the challenges of orthodontics is to avoid generating adverse effects on the root and periodontium. Correctly aligned teeth improve the redistribution of occlusal forces and make oral hygiene easier, promoting a healthier periodontium.[5] Periodontal treatments combined with orthodontic treatment, together with controlled oral hygiene, are the best treatment plan for correcting tooth relationships in patients with a history of periodontitis.[6]

Orthodontic treatment can improve facial aesthetics and masticatory function through tooth alignment; however, dental caries, enamel alterations, and gingival enlargement have been reported as complications of treatment. [7] The difficulty in maintaining oral hygiene due to the presence of orthodontic appliances, bands, and elastics leads to increased plaque accumulation, which influences an increase in the colonization of periodontal pathogens.[4,8]

It is essential that, before starting orthodontic treatment, active inflammation of the supporting tissues has been controlled and remains inactive during and after orthodontic treatment. For this reason, specialists from different areas of dentistry should be consulted to develop an interdisciplinary treatment plan to control the factors that trigger periodontal destruction and avoid iatrogenic damage to periodontal health.[9]

This case report aims to propose an interdisciplinary orthodontic, periodontal, and myofunctional management approach supported by evidence from a patient with a highly complex malocclusion with severe periodontal involvement.

CASE REPORT

A 37-year-old male patient attends an orthodontic consultation, where he reports poor dental positioning and aesthetics (Figures 1 and 2). He has no relevant medical history or harmful habits. His dental history includes promotion and prevention, dental surgery, and hygiene phases, with no history of periodontal treatment. The patient presents with active periodontal disease, with a low and unstable self-esteem scale of 10, and the desire to improve his teeth. Information about the care protocol is received and informed consent forms are signed, which were reviewed and approved by the research ethics committee at a meeting on March 3, 2021.

The extraoral photographic analysis shows a straight profile, labial biprotrusion, decreased nasolabial angle, decreased mentolabial groove, non-consonant smile, with protrusion of upper and lower incisors (Figure 1). The intraoral photographic analysis shows proinclination and protrusion of the upper and lower anterior incisors, the presence of interdental spaces, a 50% inverted vertical overbite and a negative horizontal overbite of 3.5 mm with the presence of anterior crossbite, coinciding upper and lower midlines, class III canine on the right by 3 mm and on the left by 1 mm, presence of bimaxillary anterior lingual thrust, gingival enlargement, thick periodontal phenotype, and extrusion of anterior teeth. (Figure 1)

Figure 1. Initial photographs, A) Extraoral photographs of the front, smile, and profile, B) Negative overjet, C) Upper occlusion, D) Lower occlusion, E) Right occlusion, Class III canine relationship, Class III molar relationship, F) Front occlusion with anterior crossbite, G) Left occlusion, Class III canine relationship, Class III molar relationship.

Intraoral analysis reveals generalized attachment loss, periodontal pockets between 4 and 7 mm, gingival edema and erythema, bleeding on probing in 63.5% of sites, and gingival recession RT2.11. Grade III mobility of the lower anterior incisors and grade II mobility of the upper anterior incisors with fan-shaped spacing (Figure 2). Panoramic and periapical radiographs show a lack of root parallelism and mild to moderate generalized horizontal bone loss. According to the current criteria of the EFP/AAP 2018, the diagnosis is generalized stage IV grade C periodontitis, periodontal abscesses in a patient with periodontitis located in 21, 11, 21, 22, 23, secondary occlusal trauma; a reserved prognosis is established for teeth 31, 32, 41, 42, 11, 12, 21, 22, 12, and 13.

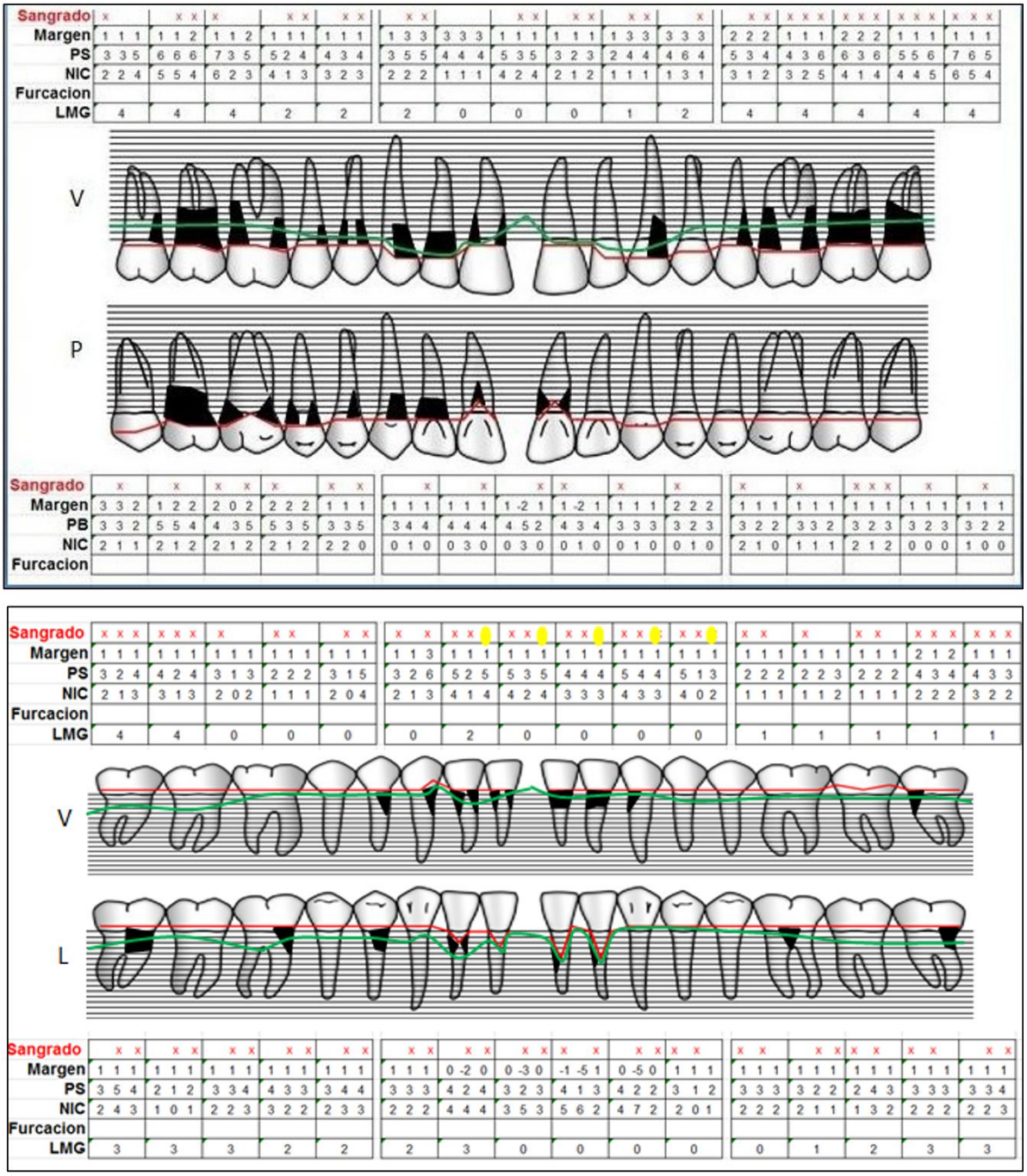

Figure 2. Initial periodontal chart.

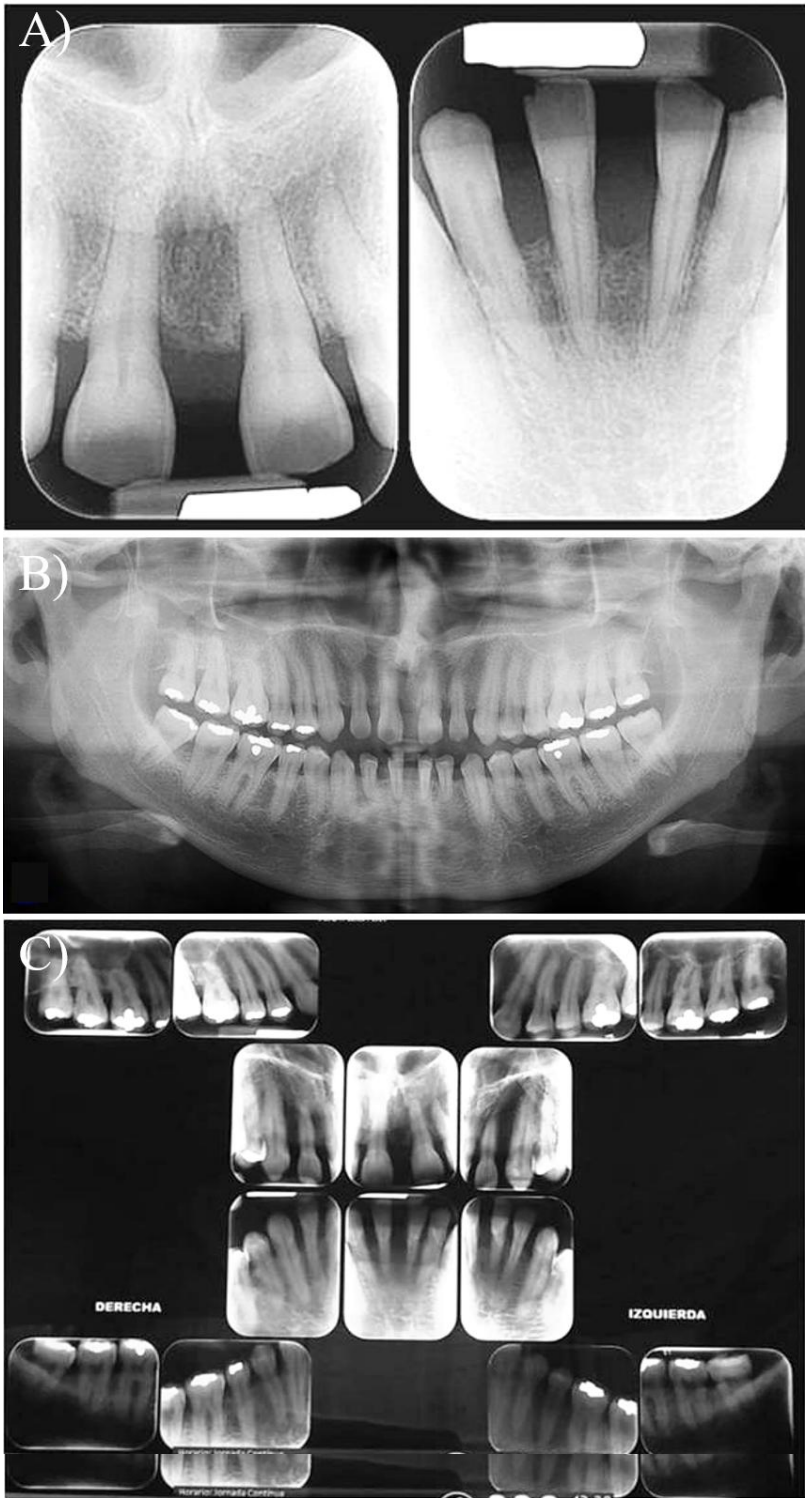

Figure 3. A) Initial panoramic radiograph, B) initial periapical radiograph of anterior teeth, C) initial periapical radiographs.

Cephalometric analysis diagnosed the patient as skeletal class I, with maxillary and mandibular prognathism, hypodivergence, microgenia, and upper and lower dental protrusion and inclination (Figure 8, Table 1).

The treatment objectives focused on improving periodontal health, reducing the bacterial plaque index and gingival bleeding index, improving the soft tissue facial profile, and reducing biproquelia. The goals of treatment were to achieve stable occlusion by eliminating occlusal trauma by uncrossing the anterior bite, generating adequate inclinations of the upper and lower anterior teeth, reducing protrusion and proinclination, closing the interdental spaces, generating adequate arch forms, improving vertical and horizontal overbite, and achieving occlusion without interference. Control and re-educate tongue posture to reduce harmful forces on the anterior teeth, allowing occlusal stability to be maintained.

Prior to starting treatment, referrals are made to speech therapy for management of tongue thrusting and to periodontics for treatment of periodontal disease. Step 1 of periodontal therapy begins with controlling the patient's risk factors, where motivation and instruction in oral hygiene are provided, followed by step 2, which involves subgingival instrumentation, closed-field scaling and root planing, a re-evaluation phase, with periodontal maintenance where there is improvement in periodontal clinical parameters (absence of periodontal pockets, BoP <10%, IP <25%) and it is decided to move on to step 3, in which gingivectomy is performed as a treatment for generalized gingival enlargement. A healing time of approximately 3 weeks is expected, and the decision is made to begin the orthodontic phase with a periodontal diagnosis of clinical periodontal health with reduced periodontium in a patient with stable periodontitis, taking into account the current criteria of the EFP/AAP 2018. [14] The patient had acceptable bone support and was motivated to improve his oral health.[15]

Lingual grid cementation is performed with tubes welded in bands of 16 and 26 due to the presence of anterior bimaxillary lingual

thrust accompanied by speech therapy. Corrective orthodontics is performed with direct cementation of Smartclip brackets, MBT slot 0.022 x 0.028" prescription, in the upper and lower arches (Figure 4).

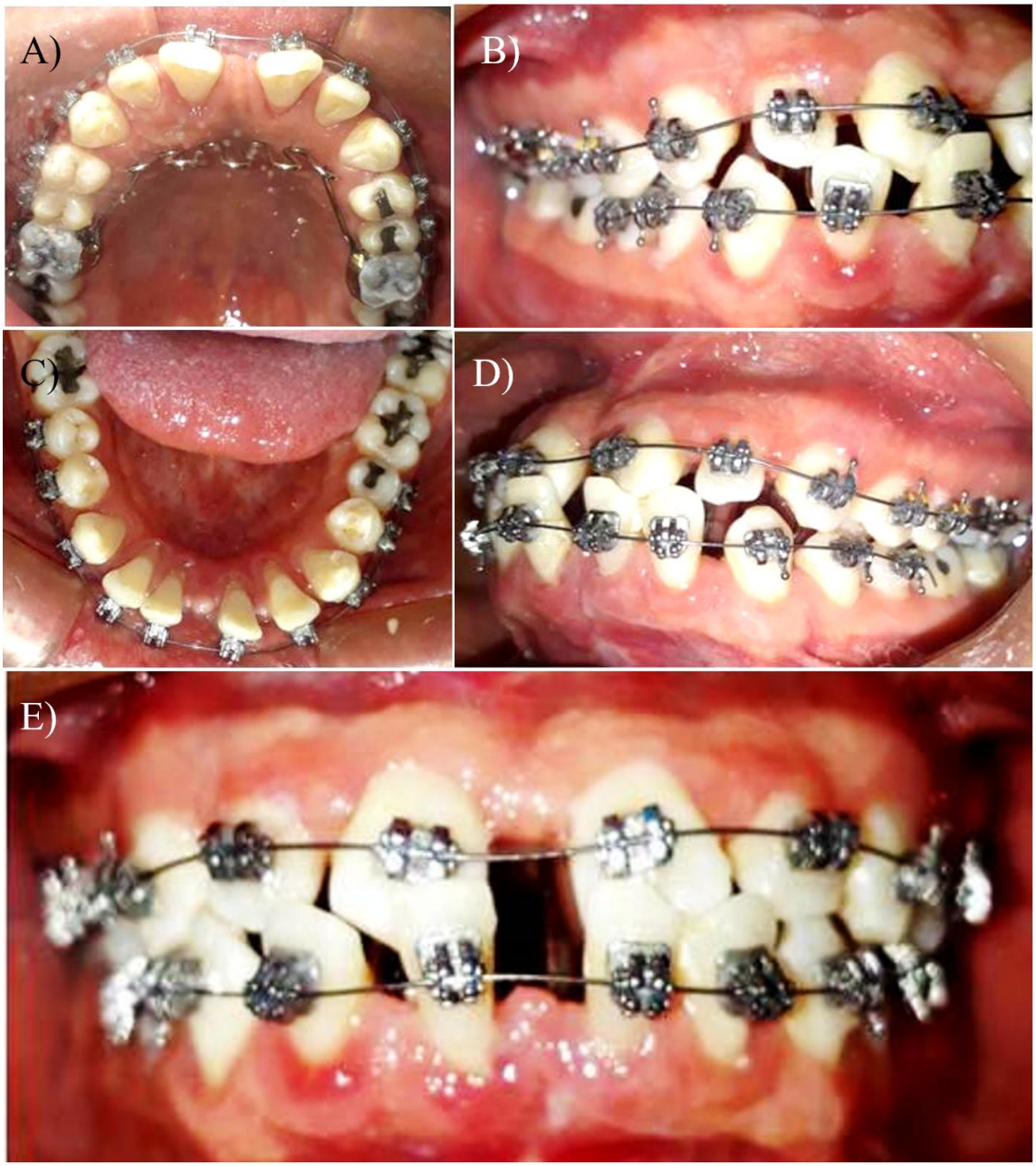

Figure 4. Corrective orthodontics, cementation. A) Upper occlusion and lingual grid cementation, B) Right occlusion, C) Lower occlusion, D) Left occlusion, E) Front occlusion.

Alignment begins with 0.014“ Ni Ti upper and lower arches with distal bend, continuing with 0.016” Australian arches accompanied by first-generation chains from 12 to 22 and 32 to 42 with medium 3/16 Class III elastic mechanics. occlusal planes are placed on the upper posterior teeth to raise the bite and achieve anterior bite decropping, with activated T-loop closures on 0.018" Australian steel arches between the lower laterals and canines, maintaining consolidated anterior lower teeth and heavy 3/16 Class III elastic mechanics (Figure 5).

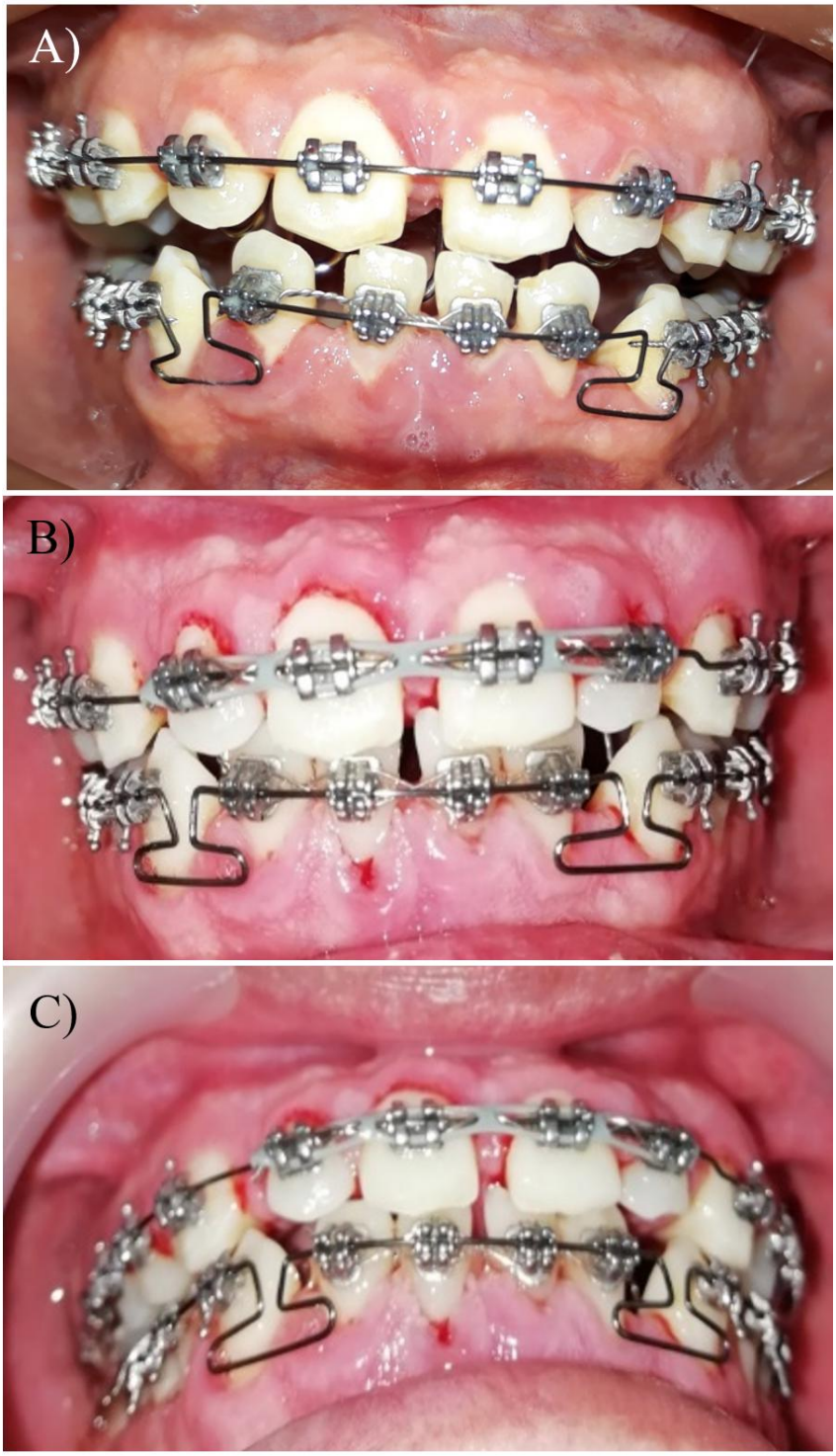

Figura 5. Corrección de mordida cruzada anterior, (a) oclusión de frente con ansas en T activadas y levantamiento de mordida, (b) sobrepaso anterior con ansas en T, (c) overjet positivo.

Periapical and panoramic control X-rays are taken to check the levels of the bone ridges and root inclinations. Subsequently, once the anterior bite has been uncrossed, occlusal trauma eliminated, and interdental spaces closed, the positions achieved are maintained with elastic chains from 13 to 23 and from 33 to 43 with reciprocal elastic mechanics (Figure 5). The working mechanics were performed with smaller Australian archwires for friction management and control.

Orthodontic treatment is accompanied by periodontal maintenance phases before each check-up. When the proper anterior relationship is achieved, the lingual grid is removed and lingual reeducators are placed on the upper and lower anterior teeth from canine to canine. 0.016 x 0.016" Ni Ti arches, previously consolidated by upper and lower sextants, are placed with continuous upper and lower elastic chains to maintain space closure. The patient is referred to postgraduate periodontics for reevaluation, gingivectomy, gingivoplasty, and zenith point leveling due to the presence of gingival enlargement (Figure 6). Referral to endodontics due to the presence of endoperiodontal lesions without root damage in teeth 32 and 42. 16 Control of tongue thrusting habit is achieved, with maintenance of supporting tissues and stable bilateral anterior and posterior patterns.

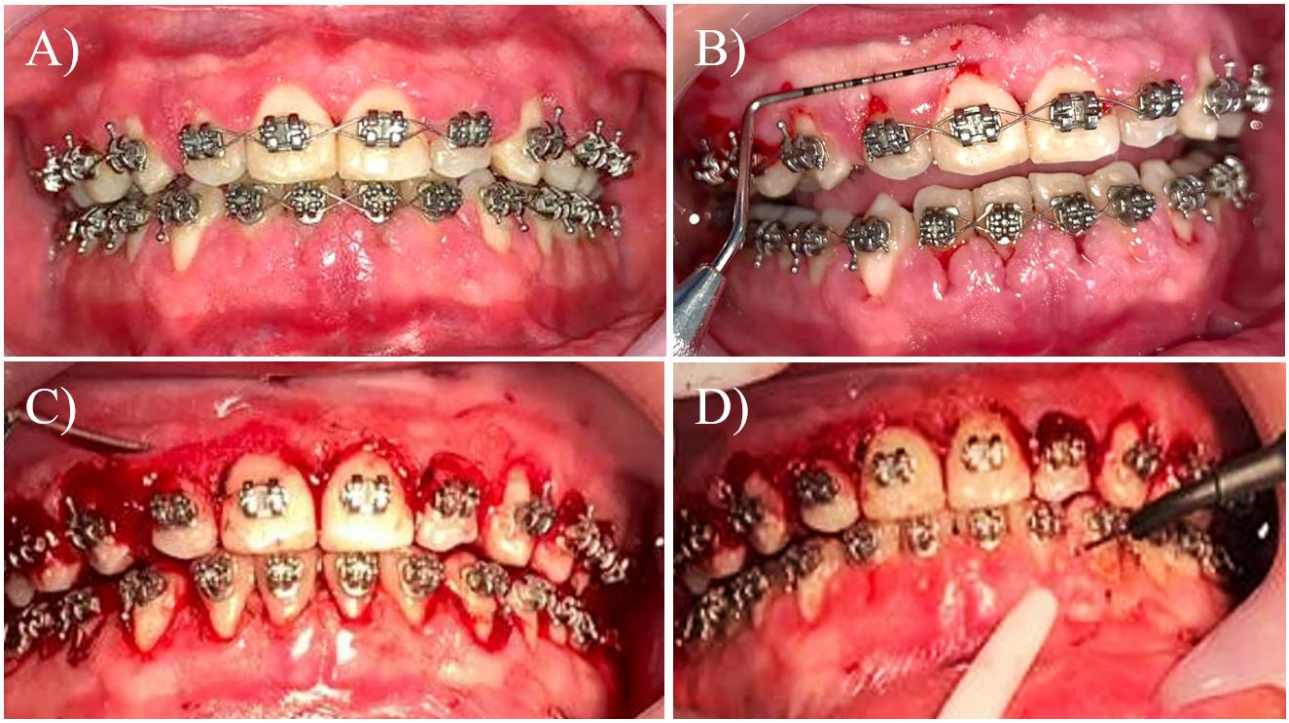

Figure 6. Periodontal surgery, (a) generalized gingival enlargement, (b,c) gingivectomy, gingivoplasty, and zenith point niveling.

CASE RESULTS

The outcome of the case after 20 months of treatment was satisfactory. The proposed objectives were achieved, the patient's soft tissue facial profile improved, with a reduction in upper and lower prognathism and hypertonicity of the orbicularis oris muscles, increasing the nasolabial angle. This achieved the expected cephalometric objectives, which improved the patient's functional and aesthetic conditions, increasing his self-esteem to a high and stable level.[10] (Figures 7 and 8) (Table 1).

Adequate occlusion was achieved by uncrossing the anterior bite, reducing the protrusion and inclination of the upper and lower anterior teeth, eliminating secondary occlusal trauma, and closing interdental spaces, which led to improved vertical overbite, horizontal overbite, canine and molar relationships. Achieving adequate arch forms, anterior coupling, and stable bilateral anterior and posterior schemes contributed to improving the prognosis without tooth loss (Figure 7).

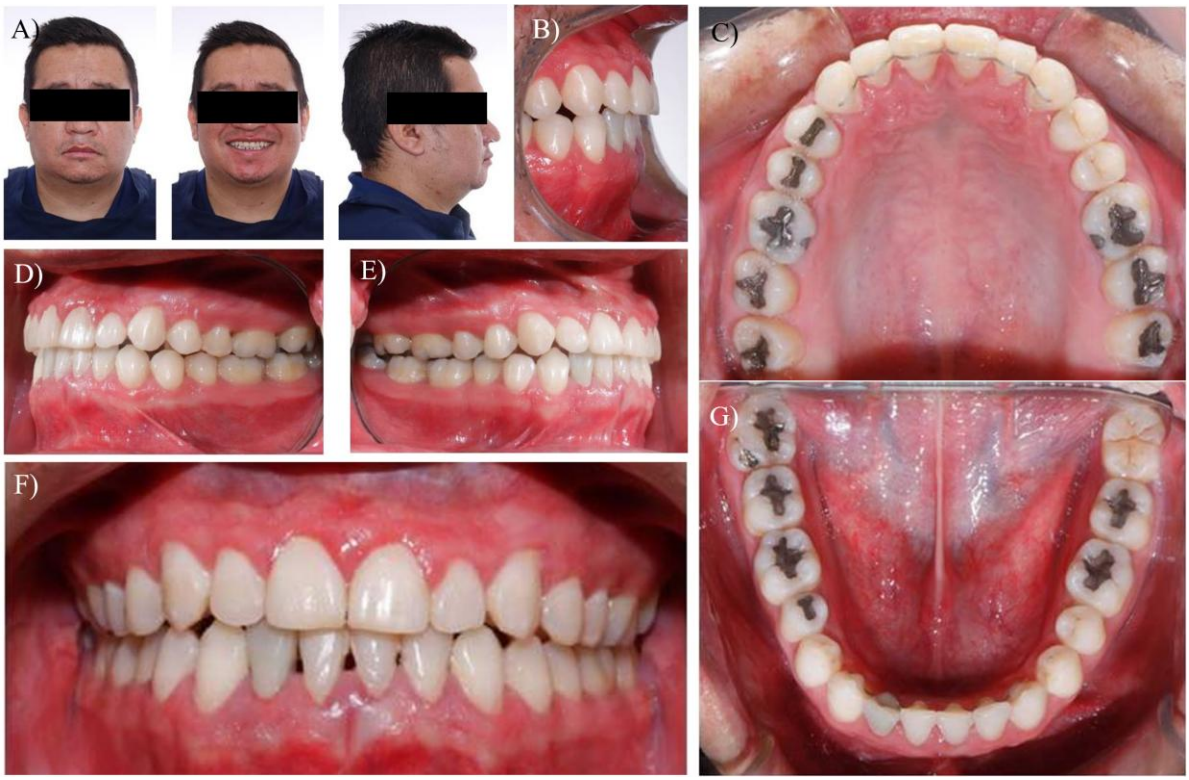

Figure 7. Final photographs, A) front, smile, and profile photographs, B) positive overjet, C) upper occlusion, D) right occlusion, E) left occlusion, F) front occlusion with adequate vertical overbite and matching midlines, G) lower occlusion.

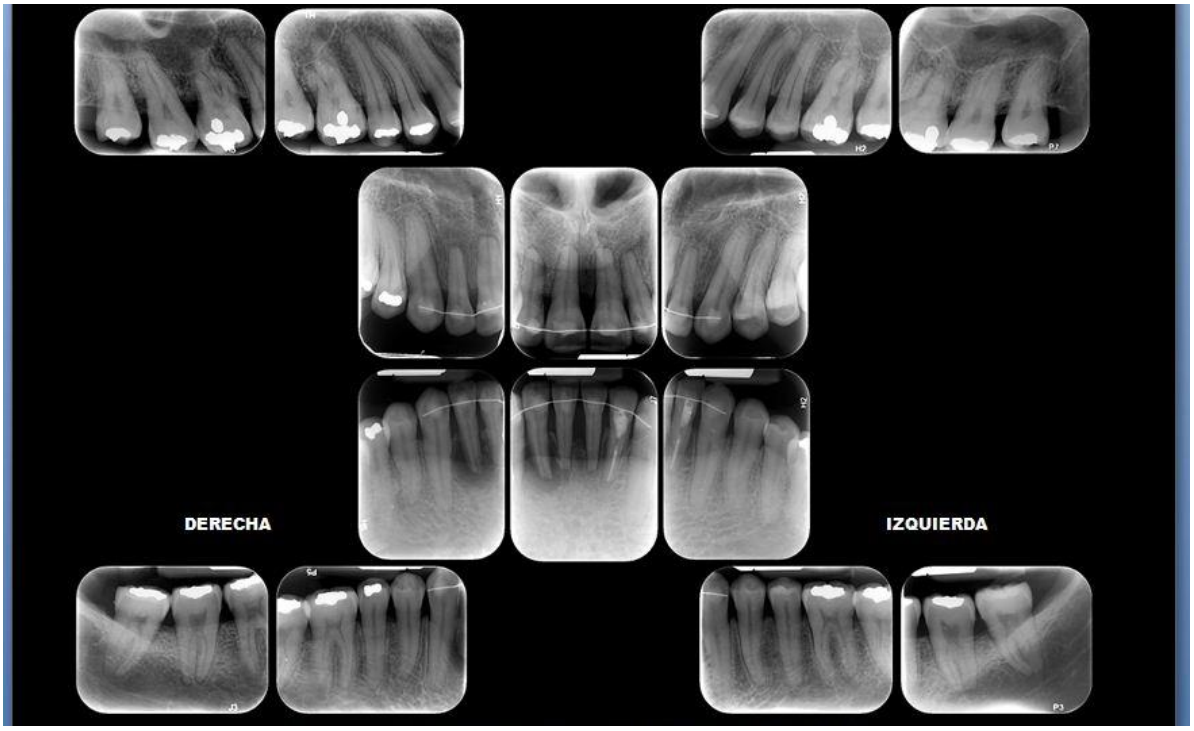

Figure 8. Complete post-treatment periapical set.

Periodontal health was maintained, with improvement in periodontal parameters, biological response in relation to bone height, and root size. It remained stable compared to the initial state. (Figures 3 and 8) The habit of bimaxillary tongue thrusting and tongue hypertonicity was controlled with the initial use of a lingual bar, followed by habit buttons, always accompanied by speech therapy and self-regulation exercises to re-educate and improve tongue position compared to the initial state.

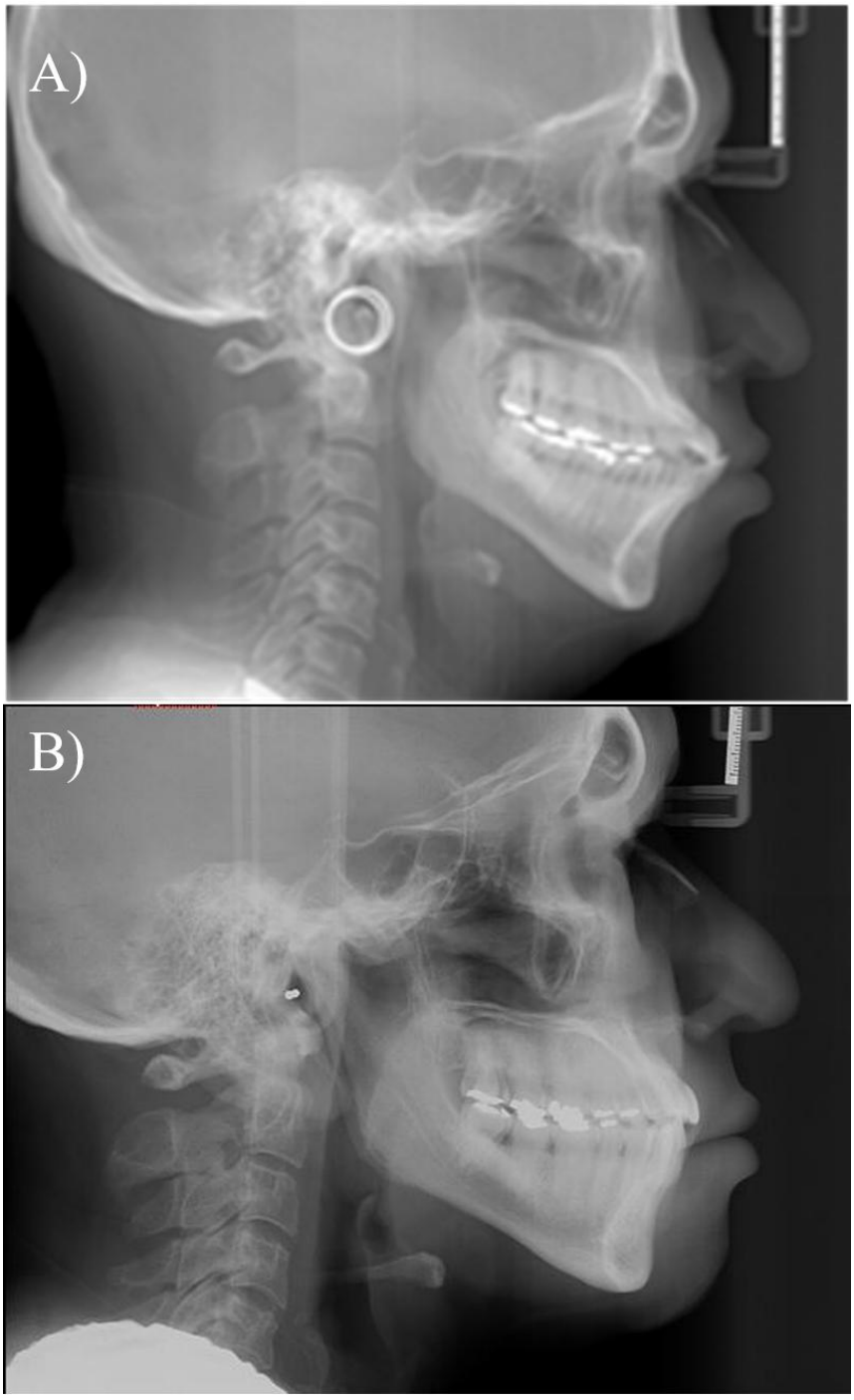

Figura 9. A) Radiografía lateral de cráneo inicial. B)) Radiografía lateral de cráneo postratamiento.

Table 1. Cephalometric values.

STEINER ANALYSIS	NORM	START	FINAL
SNA	82°	95°	92°
SNB	80°	92°	90°
ANB	2°	3°	2°
SN – OCL	14. 5°	3°	5°
SN – GoGn	32°	30°	32°
1 – SN	103°	127°	123°
1 – PP	106°-112°	137°	131°
1 – NA	22°	33°	31°
1 – NA	4mm	9 mm	8mm
1 – GoGn	90°	104°	89°
1 – NB	25°	45°	30°
1 – NB	4mm	16 mm	7mm
Pog – NB	2mm	-2 mm	-3mm
1 – 1	130°	98°	126°
Eje Y de Cto (S-N_S-Gn)	66°	62º	63°

The patient is monitored after removing the orthodontic appliances, where the stability of the occlusal schemes achieved and the condition of the retention appliances are evaluated. Periodontal checks are performed every month to assess the appearance of periodontal pockets, gingival inflammation, and gingival enlargement, accompanied by periodontal maintenance and hygiene phases.

DISCUSSION

This clinical approach, documented with objective parameters, offers a reliable approach for similar cases, highlighting that even in situations with a complex prognosis, the disciplinary integration of specialties can transform expected results. The patient in this case initially presented with a regular dental survival rate of the anterior teeth with a reserved prognosis and risk of loss due to the advanced stage of his periodontal disease. Knowing the prognosis, it was decided to initiate interdisciplinary treatment with periodontics and speech therapy to stabilize the present periodontal disease and control the tongue thrusting habit. Orthodontic treatment focused on applying light, continuous forces, which allow for low-friction movements to uncross the anterior bite, [17] accompanied by periodontal reevaluation and maintenance at each orthodontic checkup. The results validate this approach, despite the compromise of the lower incisors 32 and 42, which presented endoperiodontal compromise without

root damage, suggesting follow-up to achieve a better survival rate for the compromised teeth.[16]

Ghezzi et al. in 2008, and Vinod et al. in 2012, found in some studies that patients with periodontal disease may present pathological tooth migration, often with advanced infraosseous defects, along with occlusal changes caused by various factors, such as periodontal attachment loss, oral habits such as tongue thrusting, gingival enlargement, and iatrogenic factors, which may be associated with aesthetic damage to the smile line, reducing the patient's self-esteem. [17, 18]

There is a growing concern for dentofacial aesthetics in the adult population, and pathological migration of the anterior teeth is a common cause, with the destruction of dental support structures being the most relevant factor. In 2012, Vinod et al. reported that vestibular inclinations or missing teeth often lead to functional and aesthetic problems, making dental appearance the main reason for seeking orthodontic treatment. [18]

The objectives of orthodontic treatment in patients with a history of periodontitis should be planned according to the needs and demands of patients related to the improvement of masticatory function, smile appearance, and overall aesthetics. These objectives include improving spaces for possible rehabilitation with implants; aligning abutments to facilitate prosthetic restorations; elimination of occlusal trauma, obtaining a functional occlusion with uniform contacts and posterior support; reduction of overbite to achieve anterior guidance and contacts; elimination of lip and soft tissue entrapment; closure of diastemas, contact points that allow the adhesion of lingual retainers to stabilize mobile teeth; and improvement of the appearance and aesthetics of the smile.[15]

The role played by oral habits, such as tongue thrusting, can act as a primary etiological factor in malocclusion and contribute to poor occlusal intercuspation during and after treatment. Chawla et al. in 2006 found that the adaptive response secondary to tongue posture and function can persist or prevent the resolution of intra- and interarch problems, determining that posture correction and interdisciplinary follow-up with speech therapy allow the tongue and lip muscles to adapt to the improved environment, producing normal function.[19]

The patient reported in this case had periodontal compromise, a habit of anterior bimaxillary tongue thrusting with a reserved dental prognosis, and a risk of tooth loss. For this reason, the following concerns arose regarding the treatment plan: Can grafting be performed in areas with bone loss? Should we perform extractions and place implants? Can functional occlusion be achieved through interdisciplinary treatment? Should we keep teeth in the mouth that have a reserved prognosis?

Some authors have shown that horizontal bone defects are not viable for regeneration based on evidence. On the other hand, bone defects susceptible to guided tissue regeneration are vertical or angular bone defects, which present a significantly higher risk of additional bone and tooth loss. [20, 21] The patient in this case presented horizontal bone loss, which is not susceptible to regeneration as evidenced, therefore periodic periodontal maintenance is essential to improve the dental prognosis.

Various clinical studies have shown that patients with reduced periodontal tissue but healthy teeth and adequate plaque control can undergo tooth movement without compromising periodontal support. Garbo et al.[15] in 2023 indicate that both probing depth and periodontal attachment levels remain stable, teeth with pathological tooth migration were able to be maintained, intruded teeth showed bone level stability, with some degree of root resorption, in an 8.9-year follow-up after orthodontic treatment in patients undergoing periodontal maintenance therapy. In addition, patients were very satisfied with the aesthetics of their smile at the end of treatment.

Different systematic reviews have shown that orthodontic movements in patients with treated periodontitis are similar to those obtained in patients with healthy periodontium.[23, 24] Jepsen et al.[25] propose the following scenarios for the clinical practice of patients with periodontitis and the need for orthodontic treatment: Patients with successfully treated periodontitis who need orthodontic treatment, patients with undiagnosed and untreated periodontitis undergoing orthodontic treatment, patients with untreated periodontitis who need periodontal treatment and orthodontic treatment. In addition, some guidelines are proposed for periodontal care and follow-up during orthodontic therapy in patients susceptible to periodontitis, such as performing periodic plaque checks, periodontal probing every six months, and periapical radiographs once a year unless there is a pathological

finding, highlighting the importance of referring to periodontics when pathological periodontal pockets or bone loss are present and in case of doubt about periodontal status.

Pini Prato et al.[26] in 2020 indicate that the clinical parameters of plaque index and BoP should be <25% before starting treatment in patients with a history of periodontitis, In addition, they indicate the frequency of individualized periodontal maintenance, according to the initial periodontal diagnosis, suggesting that patients with grade C should undergo maintenance every 3 to 4 months, and those with stages I and II every 6 months, due to the rate of progression in advanced stages and grades.

In 2008, Lundgren et al. reported that patients with a history of periodontal disease are at greater risk of developing peri-implantitis. Implants with longitudinal bone loss are correlated with previous experience of periodontal bone loss. Therefore, natural teeth themselves must be carefully considered when planning and performing complex treatment in periodontally compromised patients. [27]

In 2012, Vinod et al.[18], and Ramachandra et al.[28] in 2011, determined that interdisciplinary treatment is often necessary to treat complex dental problems in our patients, allowing us to control the risk factors that cause tooth migration, improving their prognosis, and obtaining the best possible results in patients with advanced periodontitis.

Lindhe et al. reported that the survival rate for teeth with healthy but significantly reduced periodontium is approximately 90%, provided that periodontal disease is eradicated, risk factors are controlled, and recurrence is prevented. The survival rate increases as long as the bone support allows the tooth to remain in the arch in periodontally healthy conditions, thus ensuring that the tooth remains stable for around 14 years with a supervised care program. To achieve this goal, cooperation from the patient is essential in terms of personal care and attendance at maintenance appointments every 3-6 months. [20]

In periodontally compromised patients, one caveat is that, in order to be treated orthodontically, they must be periodontally stable. Interarch relationships can be stabilized so that dental prognoses are reserved, for better patient rehabilitation.

This clinical case was successful in achieving stability in the anterior and posterior occlusal schemes. The biological response of the bone tissue and root dental tissue to orthodontic forces showed no significant differences compared to the initial analyses for bone and root resorption, achieving occlusal stability with improvement in periodontal parameters. One limitation of the ortho-periodontal case was the inability to document follow-up after orthodontic treatment.

CONCLUSIONS

Comprehensive evidence-based clinical management, the establishment of appropriate mechanics, together with interdisciplinary treatment, provides stability, function, and aesthetics in highly complex cases, improving the patient's self-esteem.
The correct combination of orthodontic-periodontal treatment, accompanied by speech therapy, in the presence of oral habits, can effectively contribute to reducing the risk factors that cause malocclusions in adult patients.

Orthodontic treatment in conjunction with periodontal treatment can improve oral health in various situations, controlling periodontal degradation and restoring oral function.

The dental survival rate increases as long as the bone support allows the teeth to remain in the arch. Cooperation from the patient in their personal care, good dental hygiene control, and control of oral habits may be sufficient to keep the teeth in the mouth for several years.

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