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Case Report

A multidisciplinary approach to adult orthodontic treatment in the presence of chronic periodontitis

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Abstract

Adult patients with concurrent periodontal issues pose unique challenges for orthodontic treatment, yet they offer significant potential for enhancing both aesthetics and function. By employing a multidisciplinary approach, satisfactory orthodontic correction of malocclusion and notable enhancement of overall esthetics can be achieved in such periodontally compromised individuals. Present case reports of a 29-year-old female patient with dental protrusion and generalized chronic periodontitis. A multidisciplinary approach combining periodontal therapy and orthodontic intervention was meticulously executed over a 12-month period. The treatment resulted in notable enhancements in facial aesthetics, dental alignment, and periodontal health emphasizing the importance of collaborative efforts between orthodontists and periodontists in addressing the complex needs of adult patients seeking orthodontic treatment with underlying periodontal conditions.

Keywords: Chronic periodontitis, Ortho-perio relation, Multidisciplinary approach, Pathological tooth migration

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1. Background

The primary enticement for adolescents and adults seeking orthodontic treatment lies in their desire to enhance both the appearance of their teeth and overall facial aesthetics. In recent decades, there has been an increase in the number of adults seeking orthodontic care with reports indicating that around 20 to 25 percent of orthodontic patients are now adults. This reflects a societal shift towards valuing aesthetics and health consciousness over mere functionality.[1] Research suggests that orthodontic treatment not only enhances dental aesthetics but also has a positive impact on a patient's emotional well-being.[2] Several factors contribute to the growing interest in orthodontic treatment among adults, including increased awareness, improved orthodontic technologies, the availability of less conspicuous brackets, better financial means, a larger pool of skilled orthodontists, and the realization that orthodontics can impact social aspects like marriage prospects. These dynamics have led to more adults seeking orthodontic solutions.[3]

Majority of adult patients frequently present with associated periodontal problems which makes orthodontic movement of teeth questionable if not contradictory.[4] Advanced periodontal disease often includes loss of attachment, gingival recession, reduced bone support, tooth mobility, tooth migration and spacing between teeth. This functional and aesthetic impairment often affects the anterior teeth, impacting facial appearance.[5] Orthodontic treatment is no longer considered contraindicated for adults with periodontal disease. In fact, it can help restore a deteriorated dentition. However, orthodontic treatment should only begin after successful management of periodontal inflammation.

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When patients respond well to initial periodontal therapy, adult orthodontic treatment can significantly improve function and aesthetics, with a favourable long-term outlook. Maintaining good dental hygiene habits and regular periodontal check-ups are essential during and after orthodontic treatment.[6]

The case report presented here illustrates the favourable outcomes achieved in an adult patient facing periodontal challenges. These results were obtained through meticulous planning, precise treatment execution, and consistent maintenance of oral hygiene throughout the treatment process. Additionally, by exercising careful control over orthodontic forces, we were able to attain satisfactory orthodontic treatment results and establish a foundation of sound periodontal health.

1.1. Diagnosis and etiology

A 29-year-old unmarried female patient presented to us with concerns about the appearance of her teeth. She expressed dissatisfaction with wide spaces between her teeth, teeth that protruded outward, causing her to conceal her smile and engage in fewer social interactions. Her main aesthetic issue was the noticeable gaps between her teeth, which she felt detracted from her overall appearance. Upon questioning her medical history was non-contributory.

Upon extra-oral clinical evaluation, she displayed facial symmetry with a convex facial profile and potentially incompetent lips. Her facial proportions appeared within the normal range, and her growth pattern exhibited an average horizontal trend (**Figure 1:** A-C).

Intra-orally, the patient had all the permanent teeth, up to the second molars, while the third molars were notably absent in all the quadrants. Angle's Class I occlusion was evident with Class I canines and molars on both the sides. Width of attached gingiva was inadequate in relation to upper and lower incisors with pathological migration of teeth due to generalized periodontal disease causing labial flaring and diastema in the upper and lower anterior segments (**Figure 2**: A-E).

Panoramic radiograph showed presence of generalized horizontal bone loss of more than 50%, although less so in the buccal region and also confirmed the pathologic migration of teeth. Bimaxillary proclination of incisors with increased overjet, and decreased overbite were all evident on her lateral cephalogram. Based on these findings, the patient was diagnosed with skeletal and dental Class I malocclusion with generalized chronic periodontitis and pathological tooth migration (**Figure 3**: A, B).

Figure 1: Pre-treatment extra-oral photographs: **(A)** Profile; **(B)** Frontal; **(C)** Smile.

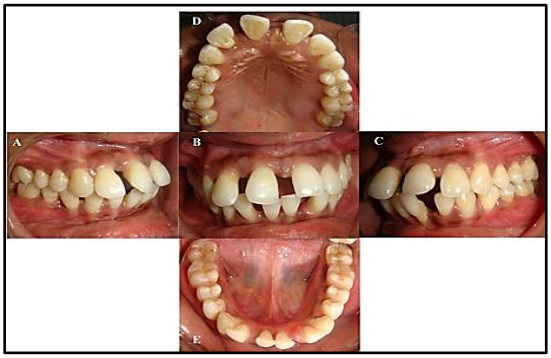

Figure 2: Pre-treatment intra-oral photographs: **(A)** Right buccal occlusion; **(B)** Frontal occlusion; **(C)** Left buccal occlusion; **(D)** Maxillary arch occlusal view; **(E)** Mandibular arch occlusal view.

Figure 3: Pre-treatment radiographs: **(A)** Panormaic x-ray; **(B)** Lateral cephalogram.

Figure 4: Upper & Lower 0.018” Australian special plus archwire with consolidation and Class I forces using pre-stretched e-chain: (A) Right buccal occlusion; (B) Frontal occlusion; (C) Left buccal occlusion.

Figure 5: Post-treatment extra-oral photographs: **(A)** Profile; **(B)** Frontal; **(C)** Smile.

Figure 6: Post-treatment intra-oral photographs: **(A)** Right buccal occlusion; **(B)** Frontal occlusion; **(C)** Left buccal occlusion; **(D)** Maxillary arch occlusal view; **(E)** Mandibular arch occlusal view.

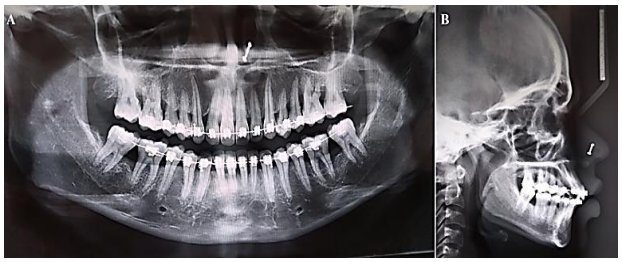

Figure 7: Pre-debonding radiographs: **(A)** Panormaic x-ray; **(B)** Lateral cephalogram

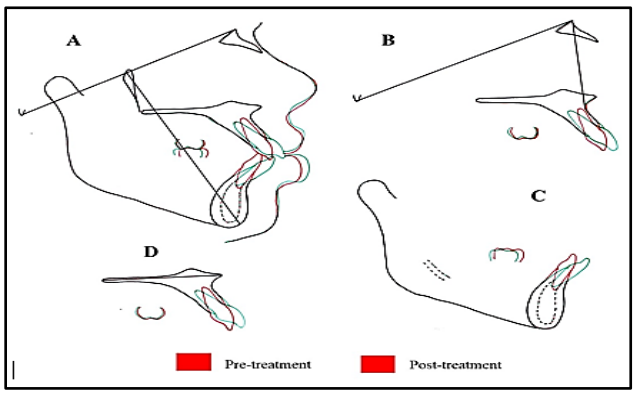

Figure 8: Pre-treatment (Green) and Pre-debonding (Red) lateral cephalometric tracing superimposition: **(A)** Nasion-Basion at Centre of cranium (CC) point; **(B)** Nasion-Basion at Nasion point; **(C)** Mandible at its internal structure; **(D)**Anterior nasal spine (ANS) - Posterior nasal spine (PNS) at ANS point.

2. Treatment Objectives

The orthodontic treatment objectives for this patient were to attain a stable occlusion, reinstate the deteriorated periodontal health in the anterior region, uphold the existing occlusion in the posterior region, and establish good soft tissue balance. These objectives were directed at precluding the reciprocal exacerbation of occlusal trauma and periodontitis, eventually enhancing facial esthetics and self-confidence.

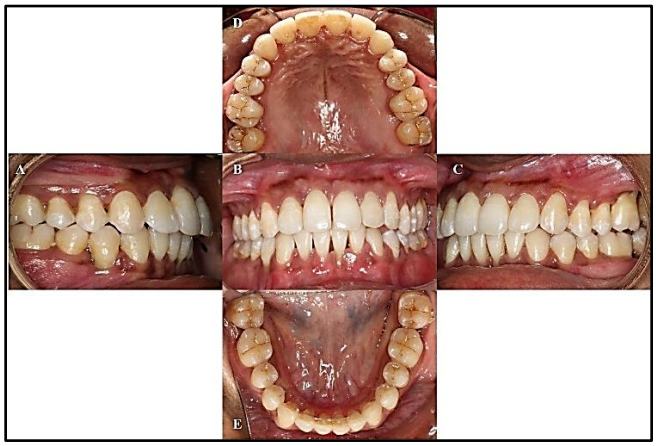

Figure 9: One-year post-treatment intra-oral photographs: **(A)** Right buccal occlusion; **(B)** Frontal occlusion; **(C)** Left buccal occlusion; **(D)** Maxillary arch occlusal view; **(E)** Mandibular arch occlusal view.

Table 1: Cephalometric changes between Pre- and Post-treatment records

Variables	Norm	Pre-treatment	Post-treatment
SNA (°)	82°	87°	87°
SNB (°)	80°	83°	83°
ANB (°)	2°	4°	4°
GoGn – SN (°)	32°	30°	31°
LAFH (mm)	-	64mm	64mm
Facial axis (°)	0°	+2°	+1.5°
U1 – NA (°)	22°	36°	16°
U1 – NA (mm)	4mm	9mm	6mm
U1 – SN (°)	102°	123°	103°
L1 – NB (°)	25°	47°	29°
L1 – NB (mm)	4mm	11mm	6mm
IMPA (°)	90°	112°	95°
S line – UL (mm)	-2mm	4mm	4mm
S line – LL (mm)	0mm	8mm	5mm

2.1. Treatment plan

A multidisciplinary treatment approach was chosen for this patient as the final treatment outcome must be certain by an orthodontist regarding the occlusion and overall esthetics and a periodontist who takes care of the periodontal health of the patient. The periodontal phase included thorough scaling and root planning of all the teeth to eliminate the primary etiological factor for periodontal disease progression and to prevent subsequent bone loss. For achieving the planned orthodontic treatment objectives, it was decided to treat this case by non-extraction fixed pre-adjusted edgewise

mechanotherapy with periodic monitoring of periodontal health status. The orthodontic forces were decided to be kept within the optimum limits to avoid any unwanted strain onto the periodontal tissue. Moreover, the patient was thoroughly explained the treatment, and informed consent was obtained after warning about potential risks such as root resorption, further bone loss around the teeth, loosening of some teeth during orthodontic treatment, possible tooth loss if bone loss persists, and worsening or recurrence of periodontal disease if proper oral hygiene is not maintained.

2.2. Treatment progress

Before starting the orthodontic treatment, the patient underwent thorough oral prophylaxis with scaling and root planing of all the teeth. Patient's periodontal status was re-evaluated after 2 weeks and was kept under periodic observation during the course of the orthodontic treatment. Once the satisfactory periodontal health was achieved, upper and lower teeth were bonded including the first molars as it will further aid in maintenance of good oral hygiene. Light forces were strategically applied to initiate the process of closing the spaces between the incisors in the beginning. Subsequently, on reaching 0.018" Australian special plus wire, a lengthy e-chain pre-stretched to exert minimal active force was meticulously placed to facilitate the closure of existing spaces in both the upper and lower arches (**Figure 4**: A-C).

By employing carefully regulated, gentle forces, we were able to successfully close the spaces in both the upper and lower incisal segments. The application of the slightest forces deemed feasible was a key factor in initiating the retraction of both upper and lower incisors, thereby reducing tooth proclination and overjet effectively. Through monthly follow-up appointments, the activation of these forces consistently facilitated the closure of spaces in both arches. Subsequently, the upper and lower arch wires were carefully removed, and Figure-of-eight ligations were applied to both dental arches to allow the teeth to settle naturally. A critical consideration in this case was the deliberate avoidance of rectangular wires due to their potential to induce root movements, thereby compromising the periodontal health of the patient. This decision was made to minimize any adverse effects on the dental and periodontal structures during and after the orthodontic treatment. Three-to-three fixed lingual retainers were then bonded in the lower arch along with upper and lower clear retainers to stabilize the outcomes. Patient was instructed to follow strict oral hygiene maintenance guidelines and report for routine follow-ups.

3. Treatment Results

The total treatment duration was around 12 months which included interdisciplinary approach and regular follow-up throughout the treatment. At the end of the orthodontic therapy, the profile of the patient had markedly improved with reduced midfacial convexity and attainment of lip competence subsequent to reduction in dental protrusion (

Figure 5: A-C). Notably, the intricate interplay between the lips, her smile, and facial aesthetics exhibited a remarkable enhancement. The maxillary and mandibular anterior teeth which had pathologically migrated were aligned within the dental arch. Optimum overjet and overbite were achieved maintaining the Class I canine and molar relationship bilaterally (**Figure 6**: A-E). The occlusal trauma had been relieved, and the periodontal health of the patient was well controlled during the entire orthodontic treatment. Furthermore, the patient demonstrated commendable diligence in maintaining oral hygiene, a fact that greatly contributed to her overall satisfaction.

The pre-debonding panoramic radiograph showed acceptable root parallelism and no marked root resorption. The level of alveolar bone was also maintained at the end of the treatment. The pre-debonding evaluation of lateral cephalogram and superimposed cephalometric tracing showed no marked skeletal changes with only major changes being in the inclination of upper and lower incisors (**Figure 7**: A & B; **Figure 8**: A-D) (**Table 1**). Patient reported for a regular follow-up after 1 year and the post-treatment results were very much stable (**Figure 9**: A-E). We recommended periodontal flap surgery for the patient's upper and lower incisors and first molars, but she chose not to proceed with it. It was suggested to maintain oral hygiene and continue the use of retainers to preserve the achieved results and assess periodically.

4. Discussion

Loss of attachment apparatus when combined with a non-periodontal related condition such as excess trauma from occlusal force, progressive migration of tooth may take place. Additionally, it can be associated with esthetic damage of smile, reducing patient's self-esteem.[6] To solve all these problems in a holistic manner, therefore, a combination of periodontic and orthodontic treatment is often needed. Before starting orthodontic treatment for patients with existing periodontal issues, thorough periodontal preparation is crucial. In such cases, it is increasingly important to identify the most effective treatments and their associated biological impacts. The primary goals include minimizing bone defects, promoting long-term oral hygiene improvements, and boosting self-confidence.[8] To achieve these objectives, it is therefore vital to focus on achieving a functional occlusion, particularly emphasizing anterior and canine guidance.[8] Previous research has indicated that teeth with compromised periodontal support can undergo successful tooth movement with proper plaque control, without jeopardizing their periodontal health.[10] The animal experiments have demonstrated that optimum orthodontic force levels do not

cause further damage to the periodontal tissues, but with presence of plaque, the same force can cause bone and attachment loss. Thus, adequate plaque control and complete eradication of inflammation are extremely important during the orthodontic treatment of patients with ongoing periodontal disease. It is obligatory review the patient every 3 to 6 months to prevent reinfection and disease recurrence.[11]

In the present case, thorough scaling and root planning was conducted before initiating orthodontic therapy to address underlying periodontal issues. Prior to bonding the orthodontic appliance, patient's compliance with maintaining good oral hygiene was observed for a month, ensuring that tooth movement would occur within a healthy periodontal environment. This precautionary step was essential to prevent potential gingival irritation and damage to supporting tissues that could have occurred if orthodontic forces were applied without prior periodontal care. As a part of the ongoing support, both periodontal treatment and the patient's commitment to oral hygiene were sustained.

Adult patients typically have high expectations, which is why it is crucial to discuss the limitations of orthodontic therapy at the outset of treatment to set realistic goals. These patients should be treated with lighter, more controlled force levels due to the risk of necrosis and compression of blood vessels in the periodontal ligament when subjected to excessive force.[12] Crestal bone loss is common in adults, necessitating adjustments in biomechanics. The shift of the center of resistance of teeth towards the apex increases the tipping moment produced by applied forces during orthodontic treatment. Properly applied mechanics are essential to manage this effectively. Throughout the course of treatment optimal periodontal health was maintained and light forces were delivered to move the teeth, as uncontrolled forces can lead to inadvertent harm to the periodontium.[12]

In cases where teeth may require splinting to prevent spontaneous migration, permanent retention is typically necessary. This phenomenon is primarily attributed to marginal bone loss, causing a shift in the center of resistance of teeth towards the apex, disrupting the balance between the forces acting on the supporting tissues and their resistance. Adults are more prone to relapse than adolescents due to their delayed attainment of neuro-muscular tissue balance.[14] Therefore, it was suggested that the patient continue to wear the removable retainers in order to prevent such relapse. At the end of the treatment, a genuine satisfaction can be appreciated on the patient’s face with the attainment of all the treatment objectives an orthodontist may desire.

5. Conclusion

Orthodontic treatment of a patient with compromised periodontal health is effective with multidisciplinary approach including cooperation from patient. Mutual aggravation of periodontitis and occlusal trauma can be prevented by careful orthodontic treatment planning and execution. A simplistic treatment planning and sequencing can help achieve desired treatment objectives. Enhancement of facial esthetics contributed to the self-confidence of an adult periodontal patient with pathologic tooth migration.

6. Source of Funding

None.

7. Conflict of Interest

None.

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