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Case Series

Perio-Ortho Treatment as a Interdisciplinary Approach for Management of Periodontally Compromised Patients. A Case Series

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Abstract

This case series presents the co-relation between the periodontal disease treatment in cooperation with orthodontic treatment, working together for complete management of the patient problems, seeking for restoring both function and esthetics. In order to achieve perfect results, we should put a sound treatment plan after reaching the accurate case diagnosis and determine its prognosis and with the coordination with other specialties as orthodontist or prosthodontist, we can reach optimum results for our patients.

Keywords: *Periodontology; Orthodontics; Clinical Attachment Loss (CAL); Radiographic Alveolar Bone Loss (RBL); Probing Pocket Depth (PPD)*

Introduction

The synergy between periodontology and orthodontic is without doubt an excellent example of the success of multidisciplinary approaches in dentistry. In esthetic dental treatments, a correct orthodontic and periodontal diagnosis and a thorough analysis of the hard and soft tissues are of crucial importance to obtain long term results in such a demanding sector. The multidisciplinary approach is often demanded because esthetic sequalae are one of the common consequences of periodontal disease. For this reason, understanding both biological basis of periodontal surgical procedures and basis of orthodontic movements can provide clinical results of excellence in esthetic area [1].

Periodontitis is one of the most common diseases, as it affects about millions of people all around the world, with a peak prevalence at 40 years of age, which become stable at older ages [2]. Based on the new classification, periodontitis is classified according to interdental Clinical Attachment Loss (CAL), Radiographic alveolar Bone Loss (RBL), number of teeth lost due to periodontitis, and the rate of disease progression. Stages I and II represents initial periodontitis, with CAL not more than 4 mm, Probing Pocket Depth (PPD) up to 5 mm and no tooth loss. Periodontitis stage III includes both criteria of higher severity (CAL ≥ 5 mm and bone loss reaching beyond the mid-root level), and complexity (deep PPD ≥ 6 mm), while stage IV not only shares these criteria, but also presents more than 4 teeth lost due to periodontitis and/or significant alterations in masticatory function [3].

One of the most common cases of periodontitis stage IV is the loss of posterior teeth resulting bite collapse with imbalanced occlusion and pathologic migration of anterior teeth that prominently changes the patient's function and aesthetics, resulting in poorer quality of life and impaired physical/psychosocial well-being [4]. At the same time, severe periodontitis has been represented as a risk factor with several systemic diseases such as an adequate periodontal treatment might improve the cardio-metabolic risk, the systemic inflammation and the overall systemic improvement in these patients [5,6].

This specific phenotype of stage IV periodontitis, recognized by posterior bite collapse, teeth drifting and flaring of the incisors, is a complexity factor not only for the management of periodontitis, but also for the prognosis of the whole dentition, hence requiring proper multi-disciplinary diagnosis and treatment planning [7]. Also, pathologic tooth migration due to the resulting traumatic occlusion results in more deterioration of the affected teeth in form of clinical attachment loss, extrusion, and increased mobility degree of the migrated teeth. Furthermore, the traumatic occlusal forces have been associated with inflammation in the periodontal ligament and with increased attachment loss. Moreover, pathologic tooth migration has been reported to have both functional and esthetic problems for the patient and can negatively influence the longevity of affected teeth [8,9].

For those patients, the need for orthodontic treatment is not only recommended, but clearly requested to restore an appropriate tooth position and balanced occlusion. Secondary traumatic occlusions due to pathologic tooth migration have been found in 50.7% of stage III and 91.3% of stage IV periodontitis patients, being more frequent in the upper teeth (74%) than the lower teeth (60%). Accordingly, orthodontic treatment is indicated for more than half of patients with severe periodontitis, specific due to pathologic tooth migration, occlusal trauma, and impaired function exist in about 66% of severe periodontitis patients. When orthodontic treatment is offered to these patients, the majority of them (60%) agree to undergo orthodontic treatment (even though the possibility for orthodontic treatment is often not present detail to these patients [10,11].

The following case series present the strong co-relation between the two specialties, both periodontology and orthodontics, in the treatment of many periodontally compromised patients.

Cases Descriptions

Case 1

A 34 years old female, systematically free, suffering from upper anterior teeth spacing between upper two central incisors, specially the upper right central incisor, which become spaced and elongated than before as she noticed and expressed by her own words (there was a previous diastema). Upon clinical and radiographic examination, the case was diagnosed with periodontitis stage IV, with infra-bony defect (Figure 1 and 2). The cause of the periodontal destruction is primary traumatic occlusion caused by parafunctional habits, in form of bruxism and tongue thrusting. At time of examination she became a passive bruxer (as she stated and clinically evident as the occlusal facets become dull not shiny) but still performing tongue thrusting. Her chief complaint is the esthetic concern about spacing and tooth position, so a consultation with an orthodontist was conducted to discusses the possibility of orthodontic correction of the tooth position and the proper time for orthodontic treatment (before or after surgical phase). We agreed to start the first three phases of treatment:

- Phase I, patient education and motivation with oral hygiene improvement.
- Phase II, breakdown of the tongue thrusting habit, using tongue creep appliance for at least 3 months, in concomitant with scaling and root planning (Figure 3).
- Phase III, surgical treatment through regenerative surgery, using barrier collagen membrane and allograft bone graft.
- Phase IV, after 6 months, orthodontic treatment should be started.

Figure 1: *Case 1: Pre-operative clinical condition (Baseline).*

Figure 2: *Case 1: Pre-operative preapical x-ray (Baseline).*

Figure 3: *Case 1: The tongue thrusting habit breaking appliance (Tongue creep).*

For phase III, the regenerative surgery was conducted using papilla preservation flap design (Figure 4), a collagen membrane and a FDBA allograft bone graft were used to treat the one wall infra-bony defect, in order to improve the tooth periodontal support to help for stable and predictable orthodontic treatment later on (Figure 5 and 6). Two weeks post-surgical the sutures were removed (Figure 7), and a SPC each 3 months was planned and executed for the patient for 6 months, to ensure getting the expected results.

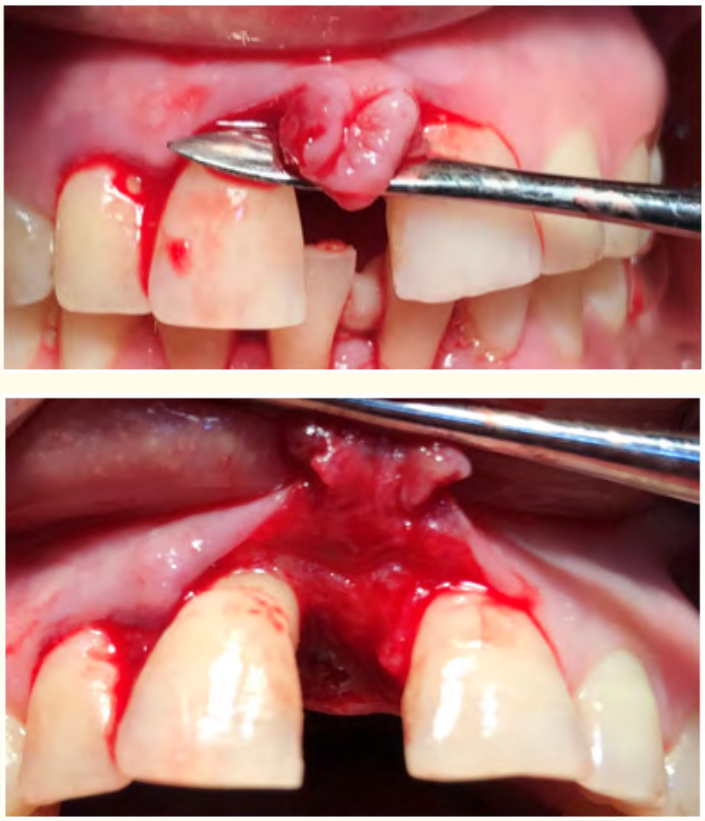

Figure 4: *Case 1: Papilla preservation flap design and infra-bony defect reveled (One wall bony defect).*

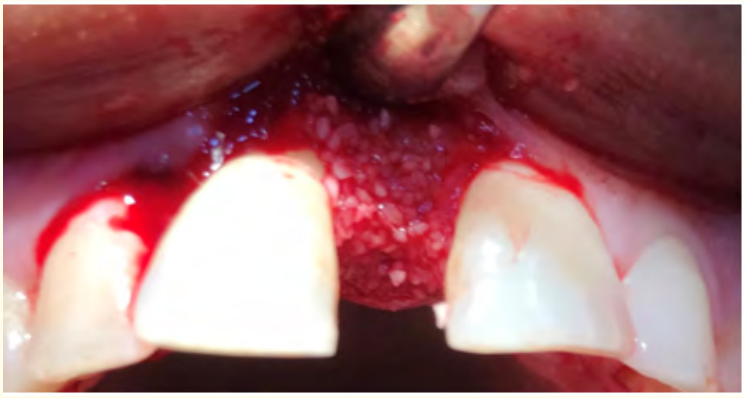

Figure 5: *Case 1: Bone graft in place (FDBA allograft).*

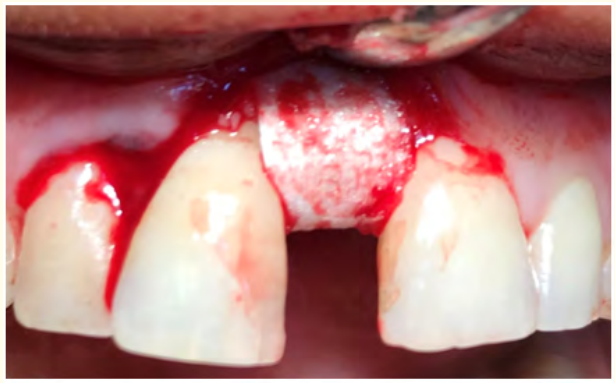

Figure 6: *Case 1: Collagen membrane in place.*

Figure 7: *Case 1: Suturing, using 5/0 prolene suture.*

After 6 months, upon clinical and radiographic examination, there were attachment gain measured and evaluated clinically and a bone regeneration evident through periapical x-ray evaluation (Figure 8). The patient sent after that to the orthodontist, who started her treatment, taking one year to move the tooth to its original place, with diastema as it was before the pathological tooth migration occurred (upon the patient request). A Supportive Periodontal Care (SPC) program was still conducted through the orthodontic treatment period. After finishing the orthodontic treatment, a clinical and radiographic evaluation was done for the periodontal tooth condition, which reveled stable level after completing the patient treatment (Figure 9 and 10).

Figure 8: *Case 1: Radiographic examination through periapical x-ray after 6 months of regenerative surgery, showing bone filling.*

Figure 9: *Case 1: Clinical examination after completing orthodontic treatment.*

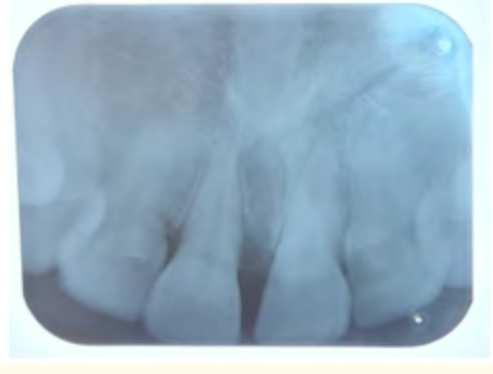

Figure 10: *Case 1: Radiographic examination after completing orthodontic treatment.*

Case 2

A 36 years old female, systematically free, fair oral hygiene level, suffered from gingival recession at her lower anterior teeth, with persistent inflammation, feared of further deterioration to occur and then lose her teeth. Upon clinical and radiographic examination, there was moderate bone lose, periodontitis stage II, with supra-bony defect and RT3 gingival recession with deficient width of keratinized gingiva (that was the cause of persistent inflammation) (Figure 11). The cause of her periodontal loss was traumatic occlusion at her anterior teeth with spacing and malposition. A consultation with an orthodontist to put a sound treatment plan for the patient, to stop destruction and periodontal deterioration through orthodontic treatment to adjust the teeth position and occlusion and improve soft tissue quality and quantity through soft tissue augmentation. The orthodontist requested to start the soft tissue augmentation first, to create soft tissue wall at the lower anterior teeth, providing a more favorable periodontal condition for the teeth during orthodontic treatment. So, the treatment plan was executed as follow:

- Phase I, patient education and motivation, with oral hygiene improvement.
- Phase II, mucogingival surgery, for soft tissue augmentation, through partial thickness apically repositioned flap and epithelized palatal free gingival graft (Figure 12-14).
- Phase III, after 3 months, to ensure soft tissue stability and maturation, orthodontic treatment should be started (Figure 15).

Figure 11: *Case 2: Pre-operative clinical condition (Baseline).*

Figure 12: *Case 2: Partial thickness, apically repositioned flap.*

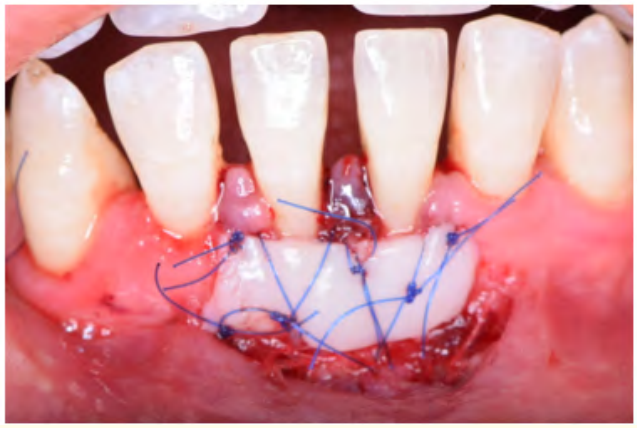

Figure 13: *Case 2: Epithelized free gingival graft fixation (Labial view).*

Figure 14: *Case 2: Epithelized free gingival graft fixation (Incisal view).*

Figure 15: *Case 2: 3 months post-surgical showed perfect soft tissue healing and maturation.*

After 3 months of complete periodontal management, the orthodontic treatment started, taken 1.5 year to be completed and through this year the patient was undergoing SPC program each 3 months (Figure 16). Results after 1.5 years of orthodontic treatment was achieved, by closing the spaces between the anterior teeth and bringing the teeth in a balanced non-traumatic occlusion, to ensure teeth periodontal condition stability. The soft tissue condition after orthodontic treatment (the result of soft tissue augmentation) was still stable, so no further surgical intervention was required (Figure 17).

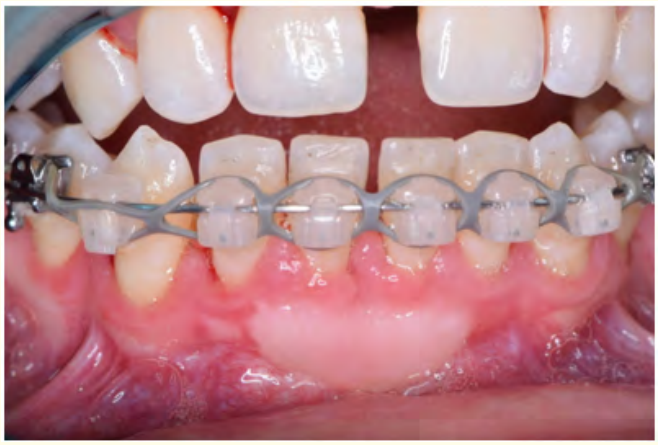

Figure 16: *Case 2: Supportive periodontal care (SPC) every 3 months, to ensure periodontal condition stability.*

Figure 17: *Case 2: Results after 1.5 years of orthodontic treatment.*

Case 3

A 29 years old male, systematically free, heavy smoker, with moderate oral hygiene, complained from spacing, food impaction and teeth mobility. Upon clinical and radiographic examination, the patient is suffering from periodontitis stage III. He had infra-bony defects related to upper posterior teeth with tooth malposition and soft tissue deficiency related to lower anterior teeth (RT3 recession with deficient keratinized gingiva) (Figure 18 and 19). Due to the teeth malposition and spacing, we decided to take an orthodontic consultation

for a complete treatment plan for the patient. For this case, the orthodontist decided to start his orthodontic treatment after elimination after stabilizing the periodontal condition and stopping the smoking habit, and after orthodontic treatment completion we can do the periodontal surgical correction as follows:

- Phase I, patient education and motivation with oral hygiene improvement.
- Phase II, breakdown of the smoking habit, it takes three months of the patient to quit smoking along with improve his oral health.
- Phase III, after reaching stable periodontal condition (pocket depth less than 4 mm, minimal bleeding on probing, new attachment gain), the orthodontic treatment had started, take 1.5 years, and through this year the patient was undergoing SPC program each 3 months.
- Phase IV, surgical treatment through regenerative surgery, using barrier collagen membrane and allograft bone graft, for treatment of infra-bony defect at posterior zone of the upper jaw. Also, a mucogingival surgery for soft tissue augmentation, through partial thickness apically repositioned flap and epithelized palatal free gingival graft, for the lower anterior teeth was conducted (Figure 20 and 21).
- Phase V, after 3 and 6 months, a follow up for periodontal condition stability, through radiographic examination and clinical evaluation was done, showed a stable result for both surgeries (Figure 22-24).

Figure 18: *Case 3: Radiographic examination of the case (Baseline).*

Figure 19: *Case 3: Pre-operative clinical condition (Baseline).*

Figure 20: *Case 3: SPC program each 3 months.*

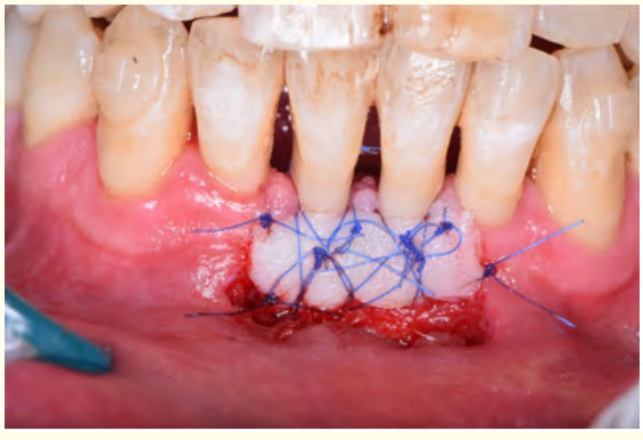

Figure 21: *Case 3: Partial thickness apically repositioned flap and epithelized palatal free gingival graft.*

Figure 22: *Case 3: Radiographic examination after 6 months of guided tissue regeneration (Upper right quadrant).*

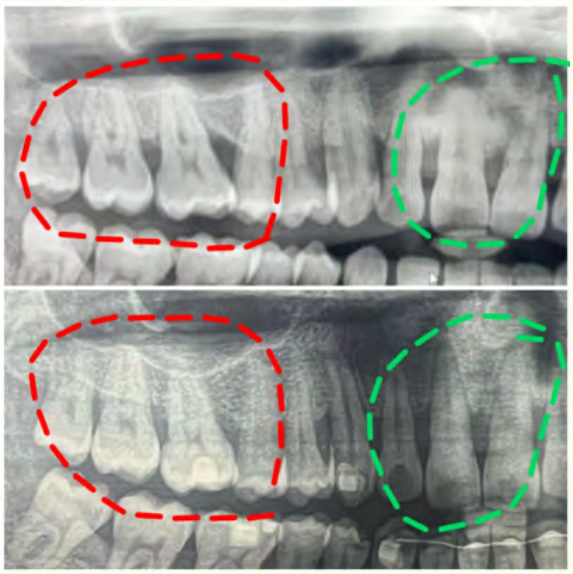

Figure 23: *Case 3: Before and after radiographic examination after 6 months of guided tissue regeneration (Upper right quadrant).*

Figure 24: *Case 3: Stable soft tissue condition after 6 months of soft tissue augmentation.*

Discussion

Orthodontic movement of the teeth is created by the application of mechanical force that transformed into biochemical reactions, which lead to a kind of aseptic inflammation and resulting in a coordinated cascade of tissue remodeling (bone resorption and bone apposition) [12]. It is well known that periodontal health (i.e., the absence of inflammation) is a must for orthodontic tooth movement through pure remodeling (i.e. without damaging the surrounding tissues). Early animal experiments have shown that orthodontic tooth movements (even complex ones like intrusion) are possible in areas of reduced (but non-inflammatory) periodontal support without

compromising their integrity, while moving teth into inflamed tissues is associated with periodontal breakdown and the formation of periodontal pockets [13,14]. Therefore, the absence of periodontal inflammation is of very big importance both for the initiation, but also the progress of orthodontic treatment.

What is the best time point of orthodontic treatment for stage IV periodontitis patients? It is well known that orthodontic treatment shouldn't start before the periodontal disease has been successfully arrested through a proper periodontal treatment. In the recent clinical practice guideline [15], the end points of periodontal treatment are considered to have been achieved when there are:

(i) No periodontal pockets with PPD > 4 mm with bleeding on probing (BOP), or

(ii) No deep periodontal pockets with PPD ≥ 6 mm [15].

Periodontal treatment formed of three phases that are executed in a serial fashion, with the last phase only carried out when the target two phases. The first phase composed of educating and motivating the patient to achieve acceptable oral hygiene level and controlling risk factors associated with the development or progression of periodontal disease. The second phase composed of the professional scaling and root planing of existing supra-gingival and sub-gingival deposits on the teeth (i.e. Biofilm/calculus), which is carried out with or without the use of adjunctive chemotherapies. However, complete elimination of biofilm/calculus isn't always possible with a non-surgical approach (i.e. sub-gingival debridement) due to the persistence of deepened periodontal pockets (defined as sites with PPD ≥ 6 mm) or anatomical complexities like root concavities, open furcation of posterior teeth, or intra-bony bone defects. Each patient has different response to the second step of periodontal treatment and after an appropriate healing period, the outcome of treatment should be reevaluated in details to see if the treatment end points have been achieved [15].

In cases of improper response to the second phase of periodontal treatment, a third phase should be done, targeting of providing access to debride deep pockets using surgical periodontal procedures or aiming to regenerate the intra-bony defects and deep furcation using evidence based surgical protocols (growth factors, membranes, and bone grafts), thus improving the diagnosis of the affected teeth and achieving the treatment end results. Once periodontal treatment is achieved successfully and the treatment end results have been reached, patients should be placed in a Supportive Periodontal Care (SPC) program [16]. It is advisable to establish early consultation between the periodontist and the orthodontist responsible for the periodontal and orthodontic treatment prior or during the first two phases of periodontal treatment. This enables the development of a mutually agreed interdisciplinary treatment plan, better coordination of treatment procedures, as well as efficient planning of time sensitive procedures [17].

As far as the specific timing when orthodontic treatment should commence is concerned, some suggest that for periodontal tissues to adequately heal, orthodontic treatment should take place 3 - 6 months after non-surgical or surgical periodontal treatment and 9 - 12 months after regenerative surgical procedures [18,19].

Through orthodontic treatment, patients may suffer from increased risk of developing a mucogingival deficiencies. This is more common if labial orthodontic movement of teeth is planned [20]. So, before starting orthodontic treatment, a thorough mucogingival evaluation should be done as a part of a full periodontal evaluation. The mucogingival assessment should include evaluating the width of keratinized gingiva, the depth of gingival recession, any high frenal attachment etc. If necessary, mucogingival therapy (i.e. gingival graft) should be performed prior to initiating orthodontic treatment. During the active orthodontic treatment, mucogingival conditions should be continuously monitored for any worsening or progression [21].

If there is any worsening or progression of the mucogingival conditions, mucogingival therapy may be necessary during the orthodontic treatment. In comparison, if the orthodontic correction of the roots toward the center of alveolar envelope is planned, the

existing mucogingival deformity may improve with orthodontic treatment. When evaluating twelve adult patients with a mandibular incisor presenting with gingival recession and with root positioned outside the alveolar bone housing, the recession depth and the width decreased by 23% and 38% respectively by moving teeth towards the center of the alveolar envelope orthodontically [22].Thus, for a patient presenting with a labially displaced tooth and a corresponding mucogingival deformity, an orthodontic evaluation and therapy may be considered as the first treatment option as opposed to periodontal mucogingival therapy [23].

Conclusion

There is a synergetic effect between the periodontal and orthodontic treatment as both has impact on each other, so it should be considered for both specialties to consult each other for their patients to guarantee an optimum treatment plan with highly predictable result by their co-operation.

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