

Case Report

Interdisciplinary Approach in Periodontology - A Mini-Review and A Report of Two Complex Cases

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Abstract

Increasing life expectancy, higher quality of biomaterials used in dentistry and the rapid evolution of clinical procedures, has led to more demanding patient requests and more complicated treatment choices. Such complex cases require holistic management, which frequently mandates clinicians to cooperate in a multidisciplinary approach, in order to fulfil therapeutical objectives and to provide successful treatment concerning functional rehabilitation and aesthetical enhancement. Periodontology cannot be

practised in isolation but has to be combined with other fields of dentistry, since periodontal diseases are quite prevalent and affect oral health in various ways. It is evident that these interactions and interrelationships between periodontology practice and other dental fields, such as endodontics, prosthodontics and orthodontics are quite crucial so as the utmost care to be delivered. Combined endodontic-periodontal lesions, adult orthodontics, especially in patients having been treated for periodontitis, prosthetic restoration and dental implant placement in patients with history of

periodontitis are some challenging treatment modalities that may require interdisciplinary approach. In the first case reported, non-surgical as well as surgical periodontal treatment and periodontal health stabilization created the proper background for successful orthodontic treatment to be applied in a patient with severe chronic periodontitis. In the second case, periodontal therapy and surgical lengthening of the clinical crowns, with respect to biological width fundamentals, provided more favourable conditions in order a patient with alternative passive eruption and gummy smile to be restored prosthetically.

Keywords: Interdisciplinary Approach; Multidisciplinary Periodontology; Periodontal Therapy; Alternative Passive Eruption; Periodontal Surgery

1. Introduction

Increased life expectancy, as well as the rapidly progressing innovations in clinical procedures and biomaterials, have resulted in more complicated treatment modalities, which may incorporate various interventions that ought to combine functional needs with higher aesthetic requirements. Additionally, as population ageing advances, more and more medically compromised patients, such as cardiovascular patients [1], seek dental and periodontal care to reestablish their dentition and their holistic management may mandate clinicians to cooperate in order to encounter composite and complex challenges in a multidisciplinary approach including the combination of many medical and dental disciplines such as periodontics, orthodontics, endodontics and prosthodontics [2, 3]. A significant proportion of patients develop periodontitis, which undoubtedly affects both oral health and patients' quality of life [4]. Nevertheless, periodontal approach is not practiced in isolation, since periodontal patients

often face a plethora of other dental needs, which have to be considered with the trend for teeth to be retained or restored, functionally and aesthetically, with satisfactory longevity. Hence, interdisciplinary approach in Periodontology declares the interactions and interrelationship between periodontal tissues or periodontal diseases and other fields of dentistry such as endodontics, esthetic dentistry, fixed prosthodontics, orthodontics and implant dentistry [3]. Understanding these interrelationships can improve the clinicians' ability to establish the correct diagnosis, to evaluate prognosis of the affected tooth or teeth and to design and carry out an appropriate treatment according to biological and clinical evidence [5].

1.1 Interdisciplinary approach in periodontology

Interaction between periodontology and endodontics is reported primarily because of the combined endodontic-periodontal lesions, which may be challenging concerning diagnosis and management. Communication between dental pulp and periodontium can be achieved by three avenues: exposed dentinal tubules, small portals of exit and the apical foramen. From apical foramen and/or the openings of the small portals of exit, the infected pulp elicits an inflammatory response in the periodontal structures [6]. On the other hand, it has been suggested that periodontal disease has no severe effect on the pulp, except the case that periodontal disease leads to advanced attachment loss, where lateral or accessory canals might be connected with the oral environment. When the apical foramen is affected, dental pulp may cause a chronic inflammatory reaction followed by pulp necrosis [7, 8]. Common pathogen profiles, from a microbiological perspective, have been detected in endodontic samples and also in teeth with chronic periodontitis. These pathogens have been considered to lead to pulp necrosis and inflammatory

periapical lesion formation [9, 10]. Additional contributing factors, such as poor endodontic treatment or poor restoration, trauma, root resorption and dental malformations, which decrease treatment success rate, have been reported to influence the ecological balance between endodontium and surrounding periodontal tissues [11, 12, 13]. A classification for diagnosis and treatment of combined endo-perio lesions is suggested, and is divided into three categories: i) primary endodontic disease with secondary periodontal involvement, ii) primary periodontal disease with secondary endodontic involvement and iii) true combined diseases [5, 14]. Treatment prognosis depends primarily on the diagnosis of the specific category and two main factors are considered for appropriate decision-making: pulp vitality and type and extent of the periodontal defect [5, 15].

Given that orthodontic therapy in adults has been evolved into a frequent and predictable treatment option, many orthodontic patients present with a degree of periodontal disease or with a reduced periodontium on account of periodontitis history [16, 17]. It has also been suggested that adjunct orthodontic treatment may play an important role in developing of the optimal base needed for re-establishing an esthetic and functional dentition, especially in some cases with pathological migration or in cases where unfavorable tooth position cause remaining periodontal infection [16, 18]. Further indications of orthodontic interventions with regard to specific periodontal disease manifestations may be space closure and/or correction of excessively tipped molars, intrusion of elongated teeth and orthodontic extrusion for managing infra-osseous defects or augmenting soft and hard tissue around hopeless teeth before implant placement [19-23]. Interdisciplinary approach between periodontology and

orthodontics needs to take special consideration on further bone loss prevention, which can lead to tooth loss or on malocclusion worsening. For these reasons, treatment modifications concerning mechanics and retention have to be considered for orthodontic patients with reduced periodontium [24]. Prior to treatment plan establishment, periodontal screening, appropriate medical history intake and clinical examination are mandatory so as primary diagnosis and initial treatment approach to be decided [25]. Periodontal therapy precedes orthodontics to ensure a healthy periodontal background with reduced pocket depths and absence of inflammatory signs and symptoms. In cases that residual deep pockets remain after initial non-surgical therapy, periodontal surgery, depending on the case requirements as well as on the anatomy of periodontal tissues (periodontal biotype, biological width), may be considered [4]. Regenerative periodontal surgery is suggested, when indicated, combined with patient's compliance in oral health instructions [16, 26]. Orthodontic treatment can be considered after periodontal tissue healing [27] and orthodontic appliances must be placed carefully, in distance from subgingival environment, so as plaque development and periodontal inflammation relapse to be prevented [28, 29]. Orthodontic forces exerted on teeth with reduced periodontium require caution and in general an appropriate force system should be followed without heavy forces that may result in harmful periodontal response [17, 18].

Prosthetic restoration of missing or damaged dentition enhances patients' comfort, function, health and aesthetics and mandates periodontal health in order desired prosthetic rehabilitation longevity to be achieved [30]. Perio-Prosthodontic interdisciplinary approach includes successive periodontal treatment and

inflammation control as well as prosthetic restoration maintenance with regard to periodontal health in the long term. Prosthesis cleansability and biologic width (BW) are two crucial parameters that have to be considered when prosthodontic treatment planning and conduction is arranged. Prosthesis cleansability is influenced by prosthesis design, pontic morphology and patient's compliance. BW is the physiologic dimension of the junctional epithelium and the connective tissue attachment and histologically, it is the combination of the averages of 1 mm of connective tissue attachment and 1 mm of epithelial attachment. Coronal to the biologic width is the gingival sulcus that is, on average, 0.69 mm [31, 32]. BW may vary in height and orientation around different teeth, based on gingival biotype and even around the same tooth, but it has been used as a guide for clinicians for decades. Fixed prostheses margin placement is suggested to follow gingival contour and not be extended more than 0.5mm into the sulcus. Otherwise gingival inflammation, attachment loss and gingival recession may be observed [33-37]. It is generally accepted among clinicians that a 3mm distance between alveolar crest and the restoration margin might significantly reduce the risk of periodontal attachment loss [35]. In the scope of the above, teeth with insufficient clinical crown height may be considered for surgical crown lengthening, aiming at creating a new gingival attachment complex and crown margins without violating BW. Apart from "functional" crown lengthening surgery, the same concept may be followed for aesthetic reasons, especially in the anterior sextants [38]. More specifically, a relatively common phenomenon that occurs in the population and affects smile aesthetics is the excess of gingival display, caused by altered passive eruption (APE) [39]. This condition is characterized by gingival overlapping over the enamel limits, resulting in a short clinical crown

appearance that gives the sensation of hidden teeth and gummy smile, especially in the presence of a medium or a high lip line [38]. APE has been classified into two types, depending on the range of gingival margin, and into two subcategories according to the distance of alveolar crest from the cemento-enamel junction [40]. Based on this classification, the necessity of osteoplasty or osseous contour modification, with cemento-enamel junction being used as a landmark, may be evaluated, when apically positioned flap is applied [41]. On the contrary, other cases may require additive methods, such as free gingival grafts, to correct gingival level and contour by augmenting the gingival tissues and reducing the height of the clinical crown [42]. In such cases the width of attached gingivae can be increased and dental hypersensitivity symptoms may be controlled [30]. Additional noteworthy factors that have to be considered in Perio-Prosthodontic interdisciplinary approach are the preparation margin, with minimal marginal opening being more favorable, since it reduces the exposed cement line and subsequent leakage [43-45], the number and quality of abutment teeth, prosthesis material and patient factors such as compliance and expectations.

When dental implants are considered for partial edentulism management, history of periodontitis has to be assessed. Dental implants are frequently used in such cases [46, 47], nevertheless, peri-implant tissues are susceptible to similar host-modulated, plaque-induced factors that cause periodontal inflammation [51, 52]. It has been stated that residual pockets may act as niches of infection for dental implants and that putative periodontal pathogens are present even after infected teeth extractions [53, 54]. With regard to clinical studies, findings coming from well-designed and recent systematic reviews advocate a probable worsening in

clinical outcomes, such as survival rates and marginal bone loss, of dental implants placed in patients with history of chronic or aggressive periodontitis [52, 53]. For all the plethora of existing clinical studies, there is no protocol homogeneity, especially in case definitions [54] and in methodological aspects, such as confounding factor control and follow up period comparability [53]. Although, history of periodontitis, even regarding the aggressive types, may not be considered an absolute contraindication for implant therapy, since dental implants can be recommended in patients successfully treated for both chronic and aggressive periodontitis [53], a supportive, preventative program for all patients, based on a risk assessment, is mandatory. During long term and individualized supportive therapy, patients should be encouraged to embrace strict compliance concerning plaque control and to regulate risk factors, such as smoking habits, which are common for both periodontal inflammation and peri-implantitis [54].

2. Case Reports

2.1 Case 1

A 45-year old female private tutor, with no reported medical conditions, presented with chronic generalized severe periodontitis and advanced bone loss, as diagnosed by clinical examination and periapical radiographs (Figure 1a). According to the latest “Classification of Periodontal and Peri-Implant Diseases and Conditions” in 2017, the patient’s periodontitis was evaluated as Stage III, Grade II [55]. Furthermore, the patient complained of occlusal disharmony, due to pathological migration and teeth spacing. Initial (stage I) treatment plan included: a) initial, non-surgical periodontal therapy, which comprised oral hygiene instructions, supra-gingival scaling and subgingival scaling and root planing, b) endodontic treatment in

relation to teeth 16, 17, 46, c) extractions of teeth 14 and 45, with poor prognosis on account of excessive mobility, overdone bone loss and combined endo-perio lesions. After initial treatment plan completion and healing period of 12 weeks, stage II treatment included: a) periodontal surgery (access flap with osteoplasty, if needed) in sites, which after re-evaluation, presented with residual probing pocket depth ≥ 6 mm and simultaneous bleeding on probing, in order to gain access for further removal of the subgingival deposits (teeth 15-17, 23 and 37) b) buco-distal root extraction in tooth 17, c) clinical re-evaluation after 1, 3 and 6 months. One year after completion of stage II treatment and since periodontal health was achieved and maintained, the patient was considered for orthodontic treatment initiation (Figure 1b). The latter was completed after 2 years (Figure 1c) and a clinical and radiographical assessment was performed (figure 1d, 1e). The same clinical status, compatible with periodontal health, good functionality and satisfying aesthetics, is still maintained, with the last re-evaluation having been lately, 4 years after overall treatment completion (Figure 1f).

2.2 Case 2

A 65-year old female, medically healthy pensioner attended our private clinic, complaining for unattractive smile and decreased function concerning her anterior teeth. Clinical examination (Figure 2a) revealed intermediate wear of the incisal plane in both mandible and maxilla, resulting in insufficient teeth height, accompanied by an excessive gingival display since the gingival margin occupied a more incisal position. Additionally, the patient presented with slight to moderate localized periodontal lesions in posterior maxilla, according the AAP Classification in regards to severity [56, 57], and with advanced carious lesions in

mandibular second molars, which were evaluated clinically and radiographically (Figure 2b). Eight weeks after mandibular second molar extractions and initial, non-surgical periodontal therapy, which included oral hygiene instructions, supra-gingival scaling and subgingival scaling and root planing, the patient presented with no periodontal pockets deeper than 3mm and with an adequate oral hygiene levels (full-mouth bleeding and plaque scores $\leq 10\%$). Anterior maxillary and mandibular manifestations were considered to be consistent with altered passive eruption and a gummy smile and hence, surgical lengthening of the clinical crowns prior to prosthetic restoration was suggested in order enhanced aesthetics to be fulfilled. According to Garber & Salama classification [40], the range of gingival margin was evaluated as sufficient and the distance of alveolar crest from the cemento-enamel junction was considered normal. Consequently, a conservative form of the apically positioned flap,

without osteoplasty, was chosen and conducted in both maxillary (Figure 2c) and mandibular anterior region (Figure 2d). Post-operative conditions were monitored and assessed and crown preparation of the anterior teeth took place after 2 months of healing period (Figure 2e). Given the fact that final prosthetic treatment should initiate at least three months after surgery [38], provisional crowns were placed (Figure 2f), for an additional month, and afterwards final impression was considered. Figure 2g depicts the final prostheses just immediately after cementation. The patient chose not to have the posterior mandibular edentulism restored with implant supported restorations, due to financial considerations. Thus, the existing partial lower denture was suggested to be repaired and relined. This particular treatment choice was a compromised treatment plan based primarily on patient's individualized desires so as not to proceed to dental implant therapy.

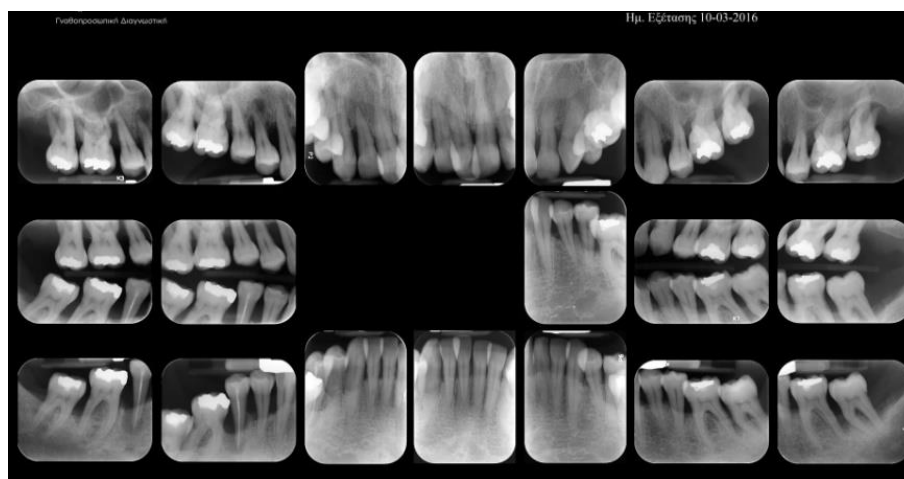


Figure 1a: Initial radiological screening with periapical radiographs.



Figure 1b: Initiation of orthodontic treatment.

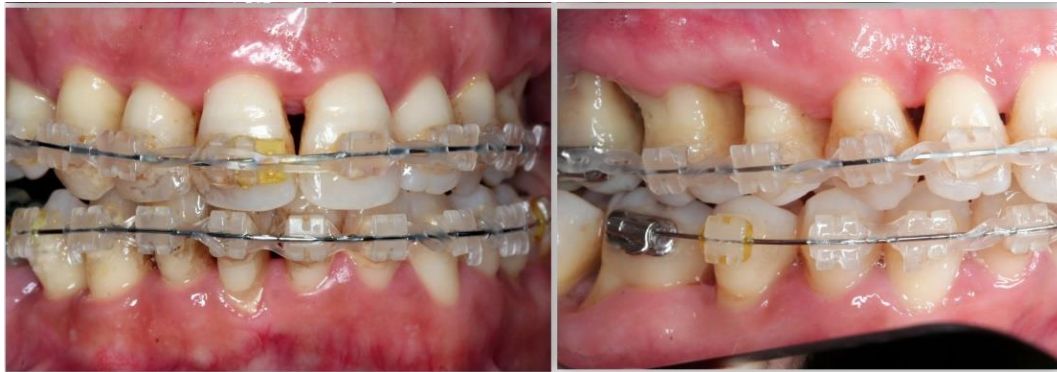


Figure 1c: Completion of orthodontic treatment.



Figure 1d: Post-treatment clinical evaluation.

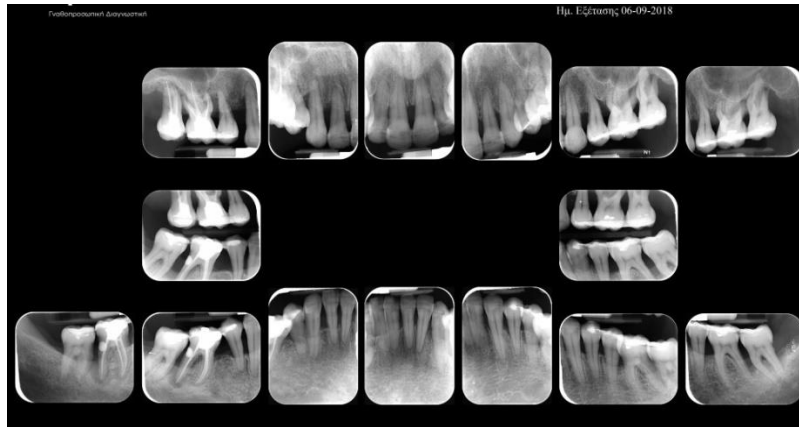


Figure 1c: Post-treatment radiological assessment with periapical radiographs.



Figure 1f: Clinical evaluation, 4 years after overall treatment completion.



Figure 2a: Initial clinical assessment.

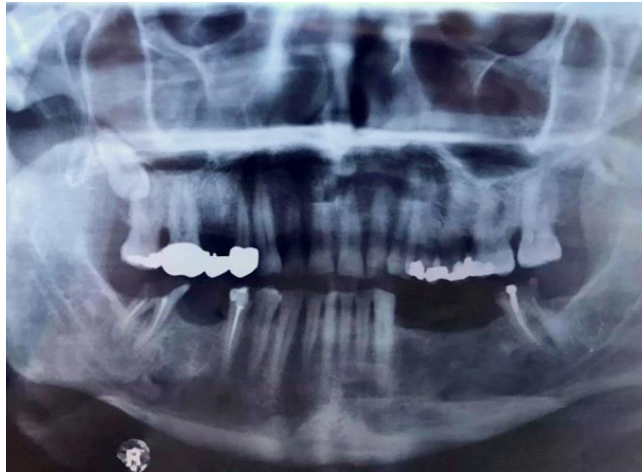


Figure 2b: Initial radiological screening with panoramic radiograph.



Figure 2c: Clinical crown surgical lengthening of the 6 anterior maxillary teeth.



Figure 2d: Clinical crown surgical lengthening of the 4 anterior mandibular teeth.



Figure 2e: Crown preparation for metal-ceramic prostheses.



Figure 2f: Provisional crowns.



Figure 2g: Final prosthetic restorations after cementation.

3. Discussion

In order clinicians to fulfill the challenging and increased functional and aesthetic requirements that have arisen nowadays and to deliver satisfying therapeutical outcomes, they should consider embracing the interdisciplinary approach, especially when complex cases are being treated. This approach may be a challenging but rewarding way concerning dentistry practice and aims at offering the patient the utmost care [58]. From a periodontal point of view, contemporary treatment may incorporate various interventions, such as surgical periodontal therapy, soft tissue management/regeneration and bone augmentation procedures [59], which eventually are capable of preventing disease progression and enhance dentition longevity. Nevertheless, initial non-surgical periodontal treatment remains the “cornerstone” of therapy as it not only improves clinical parameters in the long term [60, 61] but it also inflicts a positive influence towards patient’s perception of treatment outcomes [4]. Surgical lengthening of the clinical crown is still considered a valuable treatment modality, often carried out, prior to fixed prosthodontics treatment and may enhance functional or aesthetic conditions in a variety of complex cases, such as caries, subgingival fractures or APE [37]. These techniques include gingivectomy, gingivoplasty and apically positioned flaps with or without osteoplasty. If the remaining, post-operative gingival width is less than 3 mm, apically positioned flap may be considered a more proper choice than merely gingivectomy [62, 63]. At any case, the clinical borderline of 3 mm supracrestal soft tissue has to be taken into consideration either in the prediction of post-operative gingival vertical position or when designing crown preparation margins in such cases. Severe bone loss and reduced periodontium may lead to additional manifestations, such as pathological migration,

unfavorable tooth position or infrabony defects, which apparently cause occlusion disharmony and aesthetic concerns. These treatments may be complicated and time-consuming and therefore a “Perio-Ortho” multidisciplinary approach is often necessary [64]. Adjunct orthodontic therapy may need some modifications when patients with history of periodontitis are being treated, which were previously presented more extensively. Periodontal health and absence of inflammatory signs and symptoms, prior to and during orthodontic treatment, may be considered the key-factor for predictable and successful clinical outcomes.

Disclosure Statement

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