Merge to emerge - An interdisciplinary approach for management of periodontally compromised orthodontically treated patient

Jeevanand Deshmukh, Richa Khatri, Nagarani Buguda, Deepali Sakelle

Abstract:
In the modern day dental practice, synergy is fundamental. This synergistic effect must exist among various disciplines of dentistry for proper diagnosis, treatment planning, sequencing and execution of treatment in complex and challenging dental situations. Such collaborative effect between an orthodontist and a periodontist is essential as both works with same element, the tooth as crown-root unit with its supporting tissues. The orthodontic treatment is carried out through the medium of periodontium, so a healthy tooth supporting system is an essential prerequisite. Every potential candidate for orthodontic treatment should undergo a thorough periodontal examination. Any lously diagnosed or conducted orthodontic treatment could be a facilitator of periodontal inflammatory or infectious process especially when the patient’s oral hygiene is explicitly deficient. This case report demonstrates a challenging situation to a periodontist where patient had completed her orthodontic treatment but ended up with severe periodontal disease. The patient was thoroughly examined and a comprehensive treatment was planned and executed. Regenerative surgical procedures were done using platelet rich fibrin and hydroxapatite bone graft. Patient was followed up for 2 years. As sequelae of surgical procedures, patient had developed black triangles in the anterior region. The patient was unwilling for further perioplastic surgical procedures and further orthodontic treatment, so a gingival prosthesis using valplast was fabricated addressing her esthetic concerns.

Key words: Esthetics, platelet rich fibrin, regenerative procedures, severe periodontal disease, valplast gingival prosthesis

INTRODUCTION
The periodontal diseases are diverse group of clinical entities in which induction of an inflammatory process results in the destruction of attachment apparatus, loss of supporting alveolar bone, and if untreated tooth loss.[1] Recently, there has been increasing interest in the relationship of periodontal diseases to the long-term prognosis of various other treatment approaches carried out by other specialties of dentistry. This integrated approach between the specialties is the key to success which achieves improvement in the restoration of function, esthetics, and quality of life.[2]

One such interaction is essential between an orthodontist and a periodontist. In patients who are periodontally compromised and present with malocclusion, the orthodontic treatment can be initiated only after achieving a periodontal homeostasis. If orthodontic movement is applied in the presence of active periodontal infection, there may be a significant increase in the risk of attachment loss and bone loss, in extreme cases may provoke periodontal collapse and condemnation of the teeth to extraction.[3] The American Board of Orthodontics[4] recommends one of the following procedures before beginning orthodontic treatment in adult patients
1. Full mouth periodontal probing to detect gingival bleeding
2. Written documentation of the periodontal treatment
3. Pretreatment panoramic with bitewings and periapical radiographs.

These recommendations give an orthodontist an insight about the periodontium and it is supporting tissues through which the tooth movement has to be carried out. Any misdiagnosis...
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in comprehensively assessing the periodontal status of a patient may limit the success of orthodontic therapy and also exacerbate the periodontal disease process. The following case demonstrates such complex clinical scenario where patient had completed her orthodontic treatment but presented with an advanced periodontal disease. This challenging case was treated, considering the long-term prognosis and also to achieve periodontal homeostasis.

**CASE REPORT**

A 28-year-old female patient with a chief complaint of swollen gums was referred to the Department of Periodontology, Navodaya Dental College and Hospital, Raichur (India) completing her orthodontic treatment at a private setup. On clinical examination, patient presented with abundance of calculus, with oral hygiene index of 3.3 referring to poor oral hygiene status. Patient presented with generalized erythematous gingiva with diffuse gingival enlargement. There were generalized deep true periodontal pockets with average probing pocket depth of 7-8mm with Grade II to III mobile teeth in relation to 11, 21 [Figure 1]. Patient was systemically healthy.

A provisional diagnosis of generalized chronic periodontitis with inflammatory gingival enlargement was made. Radiographic investigations such as orthopantomograph (OPG) [Figure 2] and full mouth intraoral periapical radiographs (IOPA) were advised [Figure 3]. OPG revealed moderate-to-severe bone loss. Angular defect was best appreciated in IOPA of tooth region 11-21. The inference from the clinical and radiographic investigations leads to the definitive diagnosis of generalized chronic periodontitis. No radiographs were available for comparing the condition before the orthodontic treatment.

A comprehensive treatment plan was proposed which included an initial nonsurgical therapy, full mouth flap surgery with platelet rich fibrin (PRF), hydroxyapatite (HA) bone graft and subsequent esthetic rehabilitation along with reevaluation in between the treatment phase. The patient was explained about the treatment plan and informed consent was obtained for the same. Routine blood examinations were carried out and nothing of relevance was noted.

1. Treatment started with Phase-I therapy that included patient motivation, thorough scaling and root planning with proper oral hygiene instructions
2. Patient was on maintenance phase and recall visits were scheduled once in a month to assess plaque control measures and evaluate her response to Phase-I therapy. Re-evaluation for clinical parameters such as gingival inflammation, probing pocket depth, gingival enlargement and mobility was done after 3-month period
3. Extracoronal wire and composite splint was fabricated for tooth region 13-23 before regenerative surgical procedure to manage the mobility associated with the teeth 11, 21
4. On achieving an improvement in patient’s gingival health, decrease in clinical signs, and symptoms of gingival enlargement and inflammation. Surgical intervention was performed, that included internal bevel gingivectomy and modified Widman flap surgery to manage the gingival enlargement as well as the persistent pockets
5. Regenerative procedures were performed wherever angular defects were present. Tooth region 11-21 showed a two-walled defect [Figure 4]. Whereas 16 and 26 both showed three walled defect with Grade II furcation involvement seen in 26 [Figure 5]. After complete debridement, root bio-modification was done with tetracycline (prepared by dissolving 500 mg capsule in 10 ml of saline). PRF was prepared by drawing 10 ml of patient’s whole venous blood from antecubital fossa into sterile vacutainer tubes without anticoagulant. These tubes were then placed in the centrifugal machine at 3000 rpm for 10 min. A fibrin clot is then obtained in the middle of the tube just between the red corpuscles at the bottom and the acellular plasma at the top. The PRF thus obtained is mixed with the hydroxyapatite bone graft (sybograf™ - Eucare pharmaceuticals) with particle size ranging between 600 and 700 μ and placed in the 11–21 and 16 regions. The PRF was compressed on a glass slab to form a membrane and placed in the furcation defect of 26. Flap sutured and periodontal dressing placed
6. Postoperative instructions were given to the patient. The patient was advised to refrain from mechanical plaque control measures in the surgically treated quadrant for 2 weeks and no intrasural brushing for 8 weeks. Advised soft diet >2 weeks. The patient was advised to use chlorhexidine 0.2% rinse until the completion of the treatment. Patient was prescribed with the following antibiotic and analgesic regimen, amoxicillin 500 mg thrice daily for 5 days, ibuprofen twice a day for 3 days. Sutures were removed 7 days postsurgery
7. Patient was scheduled for maintenance therapy, recalled every 3 months in the first year and then recalled every 6 months. Patient was followed up for 2 years. Re-evaluation at the 2-year period showed an improvement in the clinical parameters, with complete resolution of gingival enlargement and establishment of knife edge margin with pink gingiva. There was a decrease in the mobility of the teeth 11, 21 from Grade III to Grade I [Figure 6]. Splint in the 13-23 region was subsequently removed. Postoperative radiographs at 9 months showed significant bone fill in the areas where regenerative techniques were performed [Figures 7 and 8].

Despite extreme care and caution, patient had loss of interdental papilla which presented as black triangles in the anterior esthetic region as a result of the extensive periodontal surgery. Patient was explained about the periodontal plastic surgical procedures. However, due to her unwillingness for another traumatic and extensive surgery and further orthodontic treatment, an alternate treatment modality of fabricating a gingival prosthesis was preferred. Prosthesis was fabricated from flexible valplast material. Custom tray was fabricated from the diagnostic impression of the maxillary arch. After border molding, a secondary impression was made with addition silicone material. Using injection molding technique valplast prosthesis was fabricated. The patient was instructed with the use of prosthesis. The patient was very much satisfied with the esthetics achieved with the prosthesis [Figure 9].

**DISCUSSION**

The long-term successful outcome is dependent on the good professional execution of the treatment plan. The first aim of
achieving the periodontal stability was initiated with Phase-I therapy. On reevaluation, the presence of advanced bone loss with deep angular defect along with increased mobility was seen in the maxillary anterior region 13–23. Therefore, an extracoronal wire with composite splint was fabricated.

The conventional splint therapy helps in redistribution of applied forces by increasing resistance. It ensures that the forces do not exceed the adaptive capacity of the periodontium. Splinting restores functional occlusion by stabilizing and
increasing masticatory function. It decreases the tooth movement three dimensionally thus stabilizes mobile teeth during regenerative surgical therapy.\[9\]

The primary objective of the periodontal therapy is to gain access to the diseased root surfaces for proper instrumentation which leads to a reduction in the pocket depth, thereby, restore the lost periodontal tissues to the disease process. The ideal long-term goal of periodontal therapy is to regenerate the lost periodontal tissue with the same structure.\[6\] By definition, regeneration includes the formation of alveolar bone, cementum, and periodontal ligament along with adequate sealing by the gingival tissue. To do so, it requires certain polypeptide growth factors that provide chemical cues to stem cells. They also regulate cellular functions such as adhesion, proliferation, migration, and differentiation in epithelium, bone and connective tissue.\[10\] In this case, regenerative surgical procedures were performed including the use of PRF and HA crystals wherever deep intrabony angular defects were seen. PRF is a second-generation platelet concentrate, considered as an autologous healing biomaterial, with numerous platelets, growth factors, and leukocytes incorporated in a matrix of autologous fibrin. Numerous growth factors are stored in alpha granules of the platelets that include platelet derived growth factor, insulin such as growth factor, vascular endothelial growth factor, and transforming growth factor. These factors stimulate cell proliferation, matrix remodeling, and angiogenesis.\[8,9\] The platelet-derived growth factor present in PRF can stimulate new bone formation by activation of osteoblasts and also exert a stimulatory effect on periodontal ligament cells. Thus, it exerts a favorable effect on periodontal regeneration by means of gain in clinical attachment level and osseous fill.\[10\] In early phase of wound healing, immobilization of the blood clot is essential for periodontal regeneration. The adhesive nature of PRF immobilizes the blood clot and bone graft which acts as a stabilizing agent and aids in regeneration. Among the various types of synthetic artificial bone substitutes porous HA resulted in clinically acceptable response when used in periodontal intrabony defect.\[11\] It is biocompatible, no allergic reactions are induced as it does not contain any organic components. It has excellent osteoconductive property which permits the outgrowth of osteogenic cells into adjacent bone graft material. It contains HA crystals with calcium to phosphate ratio of 1.67. There is no true periodontal regeneration with HA alone because only a connective tissue encapsulation of the graft with long junctional epithelium is achieved.\[12\] The combined use of PRF and HA is explained on the basis of tissue engineering, which has three elements. Scaffold, signaling molecules, and cells. This concept becomes applicable to present method as HA and PRF are suitable scaffold and growth factor, respectively.\[13\] The mobility of the teeth eventually improved after regenerative therapy and the radiographic reevaluation showed bone fill at 6-month period. There was an overall improvement in the clinical parameters. The use of this combination was economical and reasonable. All these criteria justified the use of bone graft along with PRF. The patient was followed up for 2 years, and a complete periodontal stability was achieved.

As a sequelae of periodontal surgery patient had developed unsightly black triangle in the anterior esthetic region. The patient insisted for not undergoing another extensive traumatic surgery, considering the young age of the patient and her esthetic demands an alternate treatment option was proposed. Gingival prosthesis using a valplast material was fabricated. When there is a loss of periodontal soft tissue through periodontal disease, surgical procedure or trauma this type of prosthesis can be fabricated. The patients with poor oral hygiene or high caries rate and those with active periodontal disease are not the suitable candidates for such prosthesis.\[14\] Valplast is a commercially available special flexible resin that gets adapted in the mouth. It is highly biocompatible as it is free of monomer and metal. The translucency picks up the underlying tissue tone making it virtually invisible, thus improves the esthetics. It’s fabrication involves only noninvasive procedures.\[15,16\] The desires of the patient were met, both esthetic and functional rehabilitation was achieved.

CONCLUSION

Our case report highlights the need for complete and correct diagnosis, good treatment planning, good professional execution in patients undergoing orthodontic treatment who are periodontally compromised. Such complex situations are multifactorial in nature which needs to be discussed by professionals of various dental specialties to achieve long term therapeutic success. One must not ignore the tangible benefits achieved by interdisciplinary approach. This case report not only dealt with periodontal stabilization using the bioactive substances such as PRF in conjunction with bone graft but also highlighted the alternative noninvasive prosthetic rehabilitation for loss of interdental soft tissue. The desire of the patient was met by the use of flexible valplast gingival prosthesis that resulted in pleasing esthetic appearance. This case report focuses the periodontist as a central player in the management of this challenging dentofacial problem.

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Conflicts of interest
There are no conflicts of interest.

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