CRIMSON PUBLISHERS
Wings to the Research

Modern Research in Dentistry

Review Article

Ortho- Perio Synergy - A Review

Jeevan M Khatri[1], Manjusha M Jadhav[2]* and Gaurav H Tated[2]

[1]*Professor & HOD, Department of Orthodontics and Dentofacial Orthopedics, CSMSS Dental College & Hospital, India*

[2]*Post graduate student, Department of Orthodontics and Dentofacial Orthopedics, CSMSS Dental College & Hospital, India*

***Corresponding author:** Manjusha M Jadhav, Post graduate student, Department of Orthodontics and Dentofacial Orthopedics, CSMSS Dental College & Hospital, Aurangabad, India, Tel: 9168777709; Email: *jadhavmanjusha14@gmail.com*

Submission: November 13, 2017; **Published:** February 13, 2018

Abstract

In this present era, when a significant number of patients seeking orthodontic treatment are adults, importance of interdisciplinary treatment approach cannot be overemphasized. Higher susceptibility of plaque accumulation in patients undergoing orthodontic treatment makes involvement of periodontal treatment almost unavoidable.

Orthodontic treatment aims at providing acceptable functional and aesthetic occlusions using appropriate tooth movements. These movements are specifically related to interactions of the teeth with their supportive periodontal tissues. Periodontic and orthodontic interactions usually deal with the establishment of an appropriate diagnosis and the treatment planning needed to enable coordinated perio-ortho therapy. Also, orthodontic treatment frequently results in undesirable periodontal changes which require immediate attention. More recently, orthodontics has been used as an adjunct to periodontics to increase connective tissue support and alveolar bone height. The purpose of this article is to review the adverse effects of orthodontic treatment on the periodontal tissues and to discuss the mutually beneficial relationship shared between the two specialties.

Keywords: Orthodontics; Periodontium; Periodontal disease

Introduction

The term synergy refers to two or more distinct influences or agents acting together to create an effect greater than that predicted by knowing only the separate effects of the individual agents. This definition is applicable to the classic relationship between orthodontic and periodontics specialties in treating patients. Understanding the biologic basis of periodontal surgical procedures, recent advancements in tissue engineering and research development can yield more productive clinical endpoints than ever before. Making the most of what these two specialties offer each other begins with the identification of periodontal problems that could become more complicated during orthodontic therapy and, conversely, those that could benefit from orthodontic therapy [1].

A multidisciplinary approach is often required for the correction of complex dentoalveolar problems in patients and this can be better explained by ortho-perio integration. The biologic basis of orthodontic treatment is that bone remodels and tooth moves on application of prolonged pressure to the tooth. Removal of bone occurs in some areas and addition in others, in a selective manner. In essence, the tooth socket migrates and the tooth moves through the bone carrying its attachment apparatus, i.e., periodontal ligament with it. This response occurs through mediation by the periodontal ligament; therefore, orthodontic tooth movement is basically a periodontal ligament phenomenon [2,3].

A multidisciplinary approach including an orthodontist and a periodontist is done in patients with periodontal disease. Both specialists should be involved in the treatment planning of such patients, and care should be taken in evaluation of progress of the treatment undertaken. Since orthodontic tooth movements are strongly associated with interactions of teeth and their supporting periodontal structures, we can say every orthodontic intervention has some kind of periodontal dimension. Adult patients opting for orthodontic treatment has increased recently and also the patients with periodontal problems faced by the orthodontists. Orthodontics may be an option in case of repositioning of periodontally compromised teeth. There are osteogenic changes seen in bone during orthodontic tooth movement, and there will be alteration of bone deformities and contours. The topography of the underlying bone and other intraosseous deformities influences the prognosis of periodontal therapy and pockets elimination [1,2].

Kingsley [4] stated in the late 19th century that age is hardly a limiting factor as far as tooth movement is concerned. But since then, for a long time, orthodontists limited their services to children and adolescents. However in the 1960s and 70s, prevention of oral diseases like caries and periodontal breakdown became the primary reason for seeking orthodontic treatment. Since then orthodontic treatment has been given to adults as well.

Reasons for adults seeking orthodontic treatment were enlisted by Perregaard [5] According to him, although 50% of adults seeking

orthodontic treatment report with the chief complaint of untreated malocclusion, a significant percentage of patients (12%) seek orthodontic treatment to prevent occurrence or progression of periodontal diseases. Better compliance offered by adult patients compensate for the slower tissue response.

Orthodontic patients can be classified into three categories:

a) Patients with good oral health;

b) Patients with periodontal disease and/or loss of permanent teeth; and

c) Patients with severe skeletal discrepancies.

A multidisciplinary approach involving an orthodontist and a periodontist is required to treat patients belonging to the second category. While treating such patients, both specialists should be involved in treatment planning, and the treatment progress should be evaluated.

Mechanisms of Tissue Damage

Unfestooned orthodontic bands are particularly suspects as possibly complicating factors jeopardizing interproximal periodontal support, and at the present time "special periodontally friendly bands" are being designed in research and design laboratories. These challenging effects of band impingement may directly compromise local resistance related to subgingival pathogens in susceptible patients and result in damage to both interproximal gingival tissues and alveolar crestal bone in a manner similar to that produced by faulty crown margins. Periodontal support might also be damaged during tooth intrusion where patients have active periodontitis or gingival infection significant enough to convert to periodontal disease. In these kinds of susceptible patients a screening examination for the interleukin (IL) family of inflammatory mediators may be wise. The details of genetic screening involve studying the genetic potential of exaggerated immunologic reactions of host response to bacterial challenge such as those that recruit IL-1β [5,6].

The etiology of periodontal problems may not simply rely on exaggerated host immunologic reactions. Mattingly et al. [7] and others [6-8] reflect the view that long-term fixed appliances can contribute to unfortunate but predictable qualitative alterations in the subgingival bacterial biofilms that become progressively periodontopathic with time.

On a practical level it seems that an absence of bleeding on probing is a better forecasting parameter of health than bleeding on probing is a predictor of progressive disease. In other words, an absence of bleeding on probing, despite the pocket depth can justifiably be used as a test of "healthy gums." The best test is "bleeding on probing" elicited by stroking the sulci with a flexible plastic periodontal probe at a comfortable range of force between 10 and 20g. Those orthodontic patients who present with persistent bleeding on such probing should be notified that they are "at risk" and that prudence dictates a more intensive regimen of periodontal therapy than those who present with little or no bleeding on probing. Since bleeding swollen gingiva is ubiquitous in the orthodontic population, universal caution should be employed and supportive periodontal care recommended routinely as an integral part of orthodontic therapy. Studies have pointed out the importance of a full-mouth examination, six sites per tooth, for a comprehensive description of periodontal status in orthodontic patients [1,3].

The conclusion that seems most logical is that some periodontal damage may occur, particularly in those patients who exhibit poor oral hygiene during fixed appliance therapy, but the contribution of orthodontic care is generally minor, occasionally severe enough to justify periodontal therapy and prevalent enough to indicate concomitant supportive periodontal therapy as a routine preventive tactic during fixed appliance therapy. It is advisable that professional scaling and root planning, where indicated, be performed by a periodontist [9,10].

Mucogingival Changes During Orthodontic Treatment

It has been widely believed that appropriately applied orthodontic forces do not damage the periodontium. However, insufficient width of attached gingival is widely believed to be a predisposing factor for recession. Lang & Loe [11] concluded from their study that 2mm of keratinized gingiva is adequate to maintain gingival health.

It is believed that alveolar bone dehiscence is a predisposing factor for the development of gingival recession. So as long as a tooth is housed within the alveolar bone, orthodontic tooth movement (OTM) will not result in recession. Batenhorst concluded from his experiment on monkeys that facial tipping, extrusion, and bodily movements of incisors results in apical shift of labial gingival margin and loss of attachment. However a study done on humans failed to prove the same.

Steiner [12] suggested that tension in the marginal tissue created by the orthodontic forces could be an important factor in causing gingival recession. This means, the thickness of the gingival tissue at the pressure side and not its apico-coronal width, is an indicator of possible recession. An experimental study was done on monkeys to confirm this hypothesis. Following extensive bodily movement of incisors in a labial direction, most teeth showed clinically some apical displacement of the gingival margin as well as loss of probing attachment, but no loss of connective tissue attachment when evaluated histologically.

Periodontal Tissue Response and Different Orthodontic Forces

Tooth movement induced by orthodontic force is the result of placing controlled forces on teeth. The applied force causes remodeling changes in the dental and periodontal tissues. Orthodontic force application results in compression of the alveolar bone and the periodontal ligament on one side while the periodontal ligament is stretched on the opposite side. The bone is selectively resorbed on the compressed side and deposited on the tension side [4].

i. Light orthodontic force, i.e., force less than capillary blood pressure, causes periodontal ligament ischemia with simultaneous bone resorption and deposition resulting in continuous tooth movement.

ii. Moderate orthodontic forces, i.e., forces exceeding capillary blood pressure lead to periodontal ligament strangulation resulting in delayed bone resorption.

iii. Strong/heavy orthodontic forces, i.e., forces far exceeding capillary blood pressure, cause ischemia and degeneration of the periodontal ligament on the compressed side resulting in hyalinization with more delay in tooth movement [5].

Greenbaum studied the effects of slow and rapid maxillary expansion on the periodontium. They concluded that patients subjected to rapid maxillary expansion showed significantly lesser bone relative to the cemento-enamel junction when compared to patients treated with slow expansion and the control group. However, they did not find any significant difference in probing depth and width of attached gingival between the groups.

Siew Han Chay has shown that gingival margin can be moved incisally by as much as 9mm using orthodontic extrusion. Erkan observed that gingival margin and mucogingival junction moved in the same direction along with teeth by 79 and 62%, respectively, when mandibular incisor was intruded orthodontically. Extrusion of mandibular incisor produces gingival margin and the mucogingival junction movement in the same direction as the extruded teeth by 80 and 52.5%, respectively. This also results in reduction of the sulcus depth without significant reduction in the width of attached gingival. Also, no attachment loss was observed [13].

A longitudinal study conducted by Alstad on patients undergoing orthodontic treatment did not report any significant loss of attachment. They concluded that if a professional preventive program is pursued throughout the course of orthodontic treatment, loss of attachment can be limited to less than 0.1mm per surface.

Orthodontic Treatment in Periodontally Susceptible Patient

Patients who have susceptibility to periodontal disease can be subjected to orthodontic treatment under severe control. This is undertaken to prevent biofilm formation and to eliminate periodontal pockets. Furthermore, the stable periodontal status is maintained by the orthodontics [7-10].

Although there is no clear relationship between malocclusion and periodontitis or between the effects of orthodontic tooth movement and periodontal status, the literature explains clear interaction between orthodontist and periodontist [14].

Notable contributions of orthodontist in the field of periodontics are as follows:

a) It provides well-shaped dental arches and helps in maintaining good oral hygiene. Malocclusion as a periodontal disease accelerator is eliminated in the absence of crowding of teeth

b) It orients vertical occlusal forces and makes it parallel to the long axis of the tooth. Therefore, it uniformly distributes muscle force to the dental arch

c) It helps in achieving an adequate crown-root ratio in some cases by orthodontic extrusion, with no loss of surrounding bone

d) It positions prosthetic pillars for the placement of fixed prostheses

e) It reduces bruxism during the mechanotherapy

f) It allows the use of light, precise, and continuous tooth movements.

The whole periodontal apparatus involving bone, periodontal ligament, and supporting tissues remodels with orthodontic therapy [11]. Resorption of alveolar bone seen on the pressure side and deposition on the tension side and periodontal ligament compresses and the blood vessels squeezes out which decreases blood supply [11,12]. Hydrostatic pressure in the periodontal ligament decreases on application of excessive pressure, and if it is localized to a specific region, potential of root resorption increases [15]. Apart from that, periodontal tissues having different types of orthodontic tooth movement show variation in their response.

Prevention of Periodontal Breakdown during Orthodontic Treatment

Orthodontic bands, brackets and wires not only test the patient's ability to maintain good oral hygiene, but also compromises the self-cleansing property of the dentition. Orthodontic attachments have the potential to cause plaque accumulation and increase the pathogenicity of the microbes. This tendency is often dealt with by thorough professional prophylaxis. Repeating the oral hygiene instructions on each visit and rubber cup prophylaxis are effective measures to prevent plaque accumulation and gingival enlargement. Costa et al. compared the efficacy of manual, electric and ultrasonic toothbrushes in patients undergoing fixed orthodontic therapy. They concluded that plaque scores on the buccal surfaces of teeth were lowered in patients using ultrasonic toothbrush. Also, S. mutans count reduction was seen in patients using ultrasonic and electric toothbrushes. According to Hannah, oral hygiene can be improved in orthodontic patients by using a sanguinaria-containing toothpaste along with a sanguinaria-containing oral rinse [4].

Orthodontic Treatment as an Adjunct to Periodontal Therapy

In many situations, orthodontic treatment can serve as an adjunct to periodontal therapy. Various orthodontic treatments such as uprighting, intrusion, and rotation are performed to correct the pathologically migrated teeth that control further periodontal breakdown, improve oral function, and provide acceptable aesthetics. These procedures should be performed only after controlling the periodontal disease.

Although there is no consistent relation between malocclusion and periodontal disease, certain characteristics of malocclusion can promote a pathologic environment and hinder periodontal therapy. [3] Correction of crowded or malposed teeth permit the patient better access to clean all the surfaces of his/her teeth. Food impactions are also reduced or eliminated by the creation of proper arch form and proximal contact [6].

Orthodontic uprighting of the tilted molars has several advantages: The distal movement tooth allows the deposition of alveolar bone on the mesial defect. This also eliminates the gingival folding and plaque retentive area on the mesial side [7].

Orthodontic extrusion of teeth may be indicated for shallowing out intraosseous defects and for increasing the clinical crown length of single teeth. Extrusion results in coronal positioning of intact connective tissue attachment along the tooth and also the bone deposition [8]. Orthodontic intrusion has been recommended for teeth with horizontal bone defect or infrabony pockets, and for increasing the crown length of a single tooth. The intrusion of plaque-infected teeth may lead to apical displacement of supragingival plaque, which results in periodontal destruction [9]. Professional supragingival and subgingival scalings are important during the active phase of intrusion.

Furcation defects require special attention during orthodontic treatment. They are difficult to maintain and can worsen during orthodontic treatment. In Class III furcation cases, a possible method for treating the furcation is by hemisecting the crown and root and pushing the roots apart may be advantageous [3]. The hemiseptal defects can be eliminated using uprighting, extrusion, and leveling of the bone defect [10]. Bodily movement of the tooth into an intrabony defect has been believed to “carry the bone,” along with the tooth, that results in improvement of the defect. This could improve adjacent tooth position before placement of implant or tooth replacement [6]. If the tooth is supraerupted with osseous defect, intrusion and leveling of the bone defect can help to eliminate these problems.

Tullochis of the opinion that fixed appliance therapy is more preferable if a patient is suffering from periodontitis. Fixed appliance allows easy splinting of teeth to achieve stable anchorage. He also highlights the importance of reducing the force magnitude and applying counteracting moments to reduce the stress on periodontal ligament fibres.

Lijian has enlisted the various precautions to be taken when attempting tooth movement in height-reduced periodontium, which includes achieving stable anchorage and long-term periodontal maintenance care.

Deepa reported the use of orthodontic soft aligners in repositioning a periodontally involved tooth. Light and intermittent forces generated by the soft aligner allow regeneration of tissue during tooth movement. Along with periodontal procedures, orthodontically assisted occlusal improvement may be required in treatment of patients with severely attrited lower anterior teeth [4].

Patient’s compliance, motivation, and oral hygiene maintenance will help determine the best time to start adjunctive orthodontic treatment. It is suggested that tooth movement can be undertaken 6 months after completion of active periodontal treatment if there is sufficient evidence of complete resolution of inflammation.

Sanders has recommended a three-step comprehensive protocol to be followed before, during, and after adjunctive orthodontic therapy.

Periodontics as an Adjunct to Orthodontic Treatment

On many occasions, a stable and esthetically acceptable outcome cannot be achieved with orthodontics without adjunctive periodontal procedures. For instance, a high labial frenum attachment is considered to be a causative factor of midline diastema. Frenectomy is recommended in such cases as the fibres are thought to prevent the mesial migration of the central incisors. However, the timing of periodontal intervention has been a topic of much debate.

According to Vanarsdall, surgical removal of a maxillary labial frenum should be delayed until after orthodontic treatment unless the tissue prevents space closure or becomes painful and traumatized. Forced eruption of a labially or palatally impacted tooth is now a common orthodontic treatment procedure. Careful exposure of the impacted tooth while preserving keratinized tissue requires the expertise of a periodontist. Preservation of keratinized tissue is important to prevent loss of attachment. The preferred surgical procedure is primarily an apically or laterally positioned pedicle graft [2,4].

Retention of orthodontically achieved tooth rotation is a problem that has always plagued the orthodontist. Circumferential supracrestal fiberotomy (CSF) is a procedure that is frequently used to enhance post-treatment stability. Edwards concluded from his long-term prospective study that CSF is more successful in preventing relapse in the maxillary arch. According to him, CSF does not affect the periodontium adversely [2].

Mucogingival surgeries may be needed during the course of orthodontic treatment to maintain sufficient width of attached gingival. Also, crown lengthening procedures can facilitate easy placement of orthodontic attachments on teeth with short clinical crowns. This procedure can also be used for smile designing. Alveolar ridge augmentation and placements of dental implants are the other adjunctive periodontal treatment procedures undertaken to facilitate achievement of orthodontic treatment goals [7,8].

There is an ever increasing concern for dentofacial esthetics in adult population. The primary motivating factor for seeking orthodontic treatment is dental appearance. Pathologic migration of anterior teeth is a common cause of esthetic concern among adults. The disruption of equilibrium in tooth position may be caused by several etiologic factors. These include periodontal attachment loss, pressure from inflamed tissues, occlusal factors, oral habits such as tongue thrusting and bruxism, loss of teeth without replacement, gingival enlargement and iatrogenic factors. However, according

to the literature, destruction of tooth supporting structures is the most relevant factor. The periodontal disease and its sequela such as diastema, pathological migration, labial tipping or missing teeth often lead to functional and esthetic problems either alone or with restorative problems. Advanced periodontal disease is characterized by severe attachment loss, reduced alveolar bone support, tooth mobility and gingival recession. Orthodontic treatment is initiated only after periodontal disease is brought under control. This communication highlights good treatment outcome achieved in a patient with impaired dentofacial aesthetics and advanced periodontal disease [3].

Lt. Col. M. Panwar et al. in 2010 presented a case report on combined periodontal and orthodontic treatment of pathologic migration of anterior teeth. Comprehensive orthodontics was initiated with pre-adjusted edgewise appliances using very light force, which resulted in optimal biological response. Since there was trauma from lower anterior teeth, anterior bite plane allowed posterior eruption of teeth, which resulted in the opening of the bite. The periodontal health improved the moment trauma was relieved. Periodontal treatment and the patient's co-operation in oral hygiene were also continued as supportive therapy [1,2].

Michael et al. in 2009 provided the treatment options for the significant dental midline diastema. After the required prosthetic intervention, periodontal tissues were altered by gingivoplasty and crown lengthening and provided optimal result with favorable esthetic, functional, and biologic consequences [4].

Orthodontic Treatment in Adults

In the recent era, there is a raising influx of adult patients seeking orthodontic treatment. Adult orthodontics need special consideration in several aspects such as psychosocial, biological, mechanical, and age-related considerations such as the aging of tissues, lack of growth potential, vulnerability to temporomandibular joint (TMJ) disorder, and root resorption [7].

Age per se is not a contraindication to orthodontic treatment. Compared to children and teenagers, the tissue response to orthodontic force, especially cell mobilization and conversion of collagen fibers, is much slower in adults. The hyalinized zones are easily formed on the pressure side of orthodontically moved teeth and it temporarily prevents tooth movement in the intended direction. Once the hyalinized zone is eliminated, tooth movement can occur [1].

Adult bone is less reactive to orthodontic force. Compared to the elderly, there is a greater risk of marginal bone loss and loss of attachment with mild gingival infection. Loss of attachment results in apical shift of the center of resistance, thereby increasing the distance from the point of force application to the center of resistance, which in turn increases the tipping moment produced by the given force than that of the healthy tooth. Hence, the absolute magnitude of force should be reduced [7].

Lindhe (1989) recommended the use of an interrupted force of 20-30g in adults during the initial stage of orthodontic treatment. Later, the force might be increased up to 50-80g in bodily movement and 30-50g in tipping, corresponding to a distance of movement of 0.5-1.0mm per month, depending on the amount of the remaining alveolar bone and the degree of marginal bone loss [15].

Tooth Movement and Implant Aesthetics

There are mainly three areas where orthodontics plays a role in implant rehabilitation. The lack of adequate space for implant can be managed by orthodontic movement of the neighboring teeth to an optimal position, which will allow redistribution of the available space in the dental arch and provide space for implant placement [8].

Selective orthodontic extrusion of a hopeless incisor or molar may be useful to improve the placement of a single tooth implant by vertically increasing the height of the ridge upon extrusion. Both the alveolar bone and periodontal tissues follow the extruded tooth, leading to bone formation in the direction of tooth movement.

The reduced buccolingual ridge thickness associated with extraction space shows difficulty in implant placement. It can be managed by orthodontic movement of the adjacent tooth to the edentulous space, which results in bone deposition along the tension side and the implant can be placed at the site of the orthodontically moved tooth. This is an alternative to surgical horizontal ridge augmentation [8].

Corticotomy-Assisted Orthodontics

Corticotomy-assisted orthodontics has been employed in various forms to accelerate orthodontic treatment. Rapid tooth movement associated with corticotomy was first introduced by Henry Kole [11]. The cortical plates of the bone are believed to be the main resistance to orthodontic tooth movement. In corticotomy-assisted orthodontics, rapid tooth movement is achieved by disrupting the continuity of the cortical bone by a selective cut and preserving the vitality of the teeth and marginal periodontium.

The biology behind corticotomy-assisted orthodontics is the regional acceleratory phenomenon (RAP). It is a local response of the tissue to noxious stimuli, through which the tissue regenerates at a faster rate than normal (without corticotomy). The areas around the cuts are associated with intensified bone response, i.e., increased osteoblastic-osteoclastic activity and increased level of inflammatory mediators, which accelerate the bone turnover and facilitate rapid orthodontic tooth movement [16].

Corticotomy-assisted orthodontics has several advantages such as this procedure reduces the treatment time and facilitates expansion of the dental arch and produces less root resorption rate compared to normal tooth movement due to decreased resistance from the cortical bone [2,3]. It also provides improved postorthodontic stability and slower relapse tendency [14].

Periodontally Accelerated Osteogenic Orthodontics Periodontally accelerated osteogenic orthodontics (PAOO), also termed Wilckodontics, was introduced by Wilcko et al. in 2001.

It is a revised corticotomy-facilitated technique, which involves a full-thickness labial and lingual flap elevation accompanied by selective surgical scarring of the labial and lingual cortical bones (corticotomy) followed by placement of the graft material, surgical closure, and orthodontic force application.

Rapid tooth movement associated with PAOO is substantially different from periodontal ligament cell-mediated tooth movement. Recent evidence suggests that RAP is a localized osteoporosis state, which occurs as a part of healing and may be responsible for rapid tooth movement associated with PAOO. The placement of orthodontic appliance and its activation are typically done in the week before surgical procedure. However, in complex mucogingival procedures, the absence of orthodontic appliance may enable easier soft tissue manipulation and suturing. A heavy orthodontic force immediately after surgery is usually recommended in this condition. The initiation of orthodontic force should not be delayed more than 2 weeks after surgery. The time period for RAP usually lasts for 4-6 months. A delay in activation of the orthodontic appliance will fail to take full advantage of the regional acceleratory phenomenon [2].

Piezocision-Assisted Orthodontics

Piezosurgery assisted orthodontics is a new minimally invasive surgical procedure introduced by Dibart et al. [8]. In this technique microincision is performed on the buccal gingiva that allows the piezoelectric knife to give osseous cuts to the buccal cortical plates and initiate RAP. This procedure provides rapid tooth movement without an extensive traumatic surgical approach. This procedure also maintains the clinical benefit of the bone or soft tissue grafting, along with tunnel approach.

Piezosurgery works only on mineralized tissues, sparing soft tissues and producing micrometric and selective osteotomy cuts without any osteonecrosis. Compared to the classic decortication procedure, piezosurgery has added advantages such as being minimally invasive, safe, and less traumatic to the patients. Piezocision can also be combined with Invisalign in selected cases to produce outcomes that are less time-consuming as well as satisfy the patient's desire of aesthetic appliance.

Biocompatible Orthodontic Materials

It is a well known fact that orthodontic appliances provide a good environment for oral microbes to thrive and cause diseases like dental caries or even periodontitis. It is thus natural for clinicians to try out more biocompatible materials and reduce the chances for microbial colonization. Chun et al. suggested surface modification of orthodontic wires with photocatalytic TiO2 as a method to prevent the development of dental plaque during orthodontic treatment. From their experiment, they concluded that bacterial mass bound to the TiO2-coated orthodontic wires during treatment was significantly lower than that of the uncoated wires. They also demonstrated the bactericidal effect of TiO2-coated orthodontic wires on S. mutans and P. gingivalis [14].

Since the last two decades or so, glass ionomer cements (GICs) are the most commonly used material for band cementation. This material exhibits a continuous release and uptake of fluoride, which has certain antibacterial activities. However, their antibacterial effect is limited to a relatively narrow spectrum of bacteria. Recent studies have shown that the addition of chlorhexidine (CHD) to resin composites and glass ionomer cements for cementation significantly improves the antibacterial effect. GICs with the addition of 18% CHD showed significant inhibition of bacteria in comparison with the control groups without compromising on the mechanical properties [3,5].

Accelerated Osteogenic Orthodontics and Periodontal Implications

In an attempt to reduce the treatment duration, procedures like accelerated osteogenic orthodontics (AOOs) are being popularized. Kim et al. [9] reported rapid tooth movement when temporary anchorage devices were used in combination with AOO. However, this procedure involves decortications and subsequent placement of graft material. Hence, continuous periodontal monitoring is required when this technique is employed. With the increasing popularity of these invasive procedures, partnership with a periodontist will become indispensible for orthodontists in the near future.

Esthetic Finishing of Treatment Results

Orthodontists experience different challenges in treating adults with a reduced periodontal support as compared to adolescents. Worn out tooth, abrasion, eroded teeth, missing papillae, and unequal crown lengths are common problems, and an esthetic appearance of the teeth and gingiva after bracket removal is difficult to obtain. Many incisors in adults with malocclusions have more or less worn incisal edges. This represents an adaptation to the functional demands such as mastication, swallowing, and respiration. Need for incisal grinding arises to correct rotations and axial inclination of incisors; however, association with a therapeutic dentist is necessary. The papillae may be absent in patients with advanced periodontitis and also in cases of loss of the crestal bone between the incisors, hence producing unaesthetic gaps between the teeth after orthodontic tooth movement. Recontouring of the mesiodistal surfaces of the incisors during the orthodontic finishing stage is the best method for correction of this problem [3,4].

Retention Problems and Solutions

Adults and children show different tissue reactions with adult being need a longer duration of retention than an adolescent as adults undergo extensive fixed appliance therapy. According to Proffit [17], resting pressures of lip, cheek, tongue, and forces produced by metabolic activity within the PDL are major factors that decide the final teeth positioning. In an intact periodontium, forces from periodontal membrane counteract unbalanced tongue-lip forces. Its stabilizing function fails when the periodontium breaks down and the incisors movement begins. Hence, permanent retention after the orthodontic correction is essential in persons with advanced periodontal disease.

"Normal" retention may be sufficient for patients with minimum-to-moderate loss of periodontal tissue support. Flexible spiral wire (FSW) retainer bonded lingually on each tooth is a treatment of retention in adults with reduced periodontium. FSW retainer not only works as orthodontic retainer but also simultaneously acts as a periodontal splint. This allows the individual teeth within the splint to exert physiological mobility. Excellent stability is demonstrated in long-term follow-up of patients who received combined periodontal and orthodontic treatment. It should be noted that since biting on a retainer wire can cause a high bond failure rates, bonded maxillary retainer must be seated out of occlusion with the mandibular incisors [18-20].

Periodontal health is essential for any form of dental treatment, especially for orthodontic treatment. The orthodontic treatment has two ways of action on the periodontal tissues; it provides some degree of protection to the periodontium and keeps the gingiva, the bone, and the periodontal ligament in a healthy status but on the other hand, it produces negative effects on the periodontium, mainly gingivitis, gingival recessions, and bone dehiscences, etc. [2,3].

Conclusion

In the recent years, because of the increased number of adults seeking orthodontic treatment, orthodontists frequently face patients with periodontal disease. Adult patients must undergo regular oral hygiene performance and periodontal maintenance in order to maintain healthy gingival tissue during active orthodontic therapy.

Patient's education and motivation as complemented by interdisciplinary approach transform the patient's unattractive dentition (due to migrated teeth secondary to periodontal breakdown and inflamed periodontium) into an attractive dentition with a radiant smile. Since orthodontic therapy and periodontal health shares a close relation, an understanding of the ortho-perio relationship helps in executing the best possible outcomes in needy patients.

References

1. Vinod K, Reddy YG, Reddy VP, Nandan H, Sharma M (2012) Orthodontic–periodontics interdisciplinary approach. J Indian Soc Periodontol 16(1): 11-15.
2. Deepthi PK, Arun Kumar P, Esther Nalini H, Devi R (2015) Ortho-perio relation: A review. Journal of Indian Academy of Dental Specilities Researchers 2(2): 40-44.
3. Agarwal L, Tandon R, Srivastava S, Gupta A (2016) Ortho-perio integration: An orthodontic review. Indian Journal of Multidisciplinary Dentistry 6(2): 99-103.
4. Kingsley NW (1880) Treatise on oral deformities as a branch of mechanical surgery. D. Appleton and Company, New York, USA.
5. Perrigaard J, Blixencrone-Moller T (1988) Why do adults seek orthodontic treatment? In: Proceedings of the 64th congress of the European orthodontic society. European orthodontic Society, London, England, p. 61A.
6. Moyers RE, Dryland-Vig KW, Fonsece RJ (1998) Adult treatment. In: Moyers RE, (Ed.), Handbook of orthodontics. (4th edn), Year Book medical Publishers Inc, Chicago, USA, pp. 472-510.
7. Mattingly JA, Sauer GJ, Yancey JM, Arnold RR (1983) Enhancement of streptococcus mutans colonization by direct bonded orthodontic appliances. J Dent Res 62: 1209-1211.
8. Paolantonio M, Festa F, di Placido G, D'Attilio M, Catamo G, et al. (1999) Site-specific subgingival colonization by actinobacillus actinomycetemcomitans in orthodontic patients. Am J Orthod Dentofacial Orthop 115: 423-428.
9. Sallum EJ, Nover DF, Klein MI, Gonçalves RB, Machion L, et al. (2004) Clinical and microbiologic changes after removal of orthodontic appliances. Am J Orthod Dentofacial Orthop 126(3): 363-366.
10. Perinetti G, Paolantonio M, Serra E, D'Archivio D, D'Ercole S, et al. (2004) Longitudinal monitoring of subgingival colonization by actinobacillus actinomycetemcomitans, and crevicular alkaline phosphatise and aspartate aminotransferase activities around orthodontically treated teeth. J Clin Periodontol 31(1): 60-67.
11. Lang NP, Loe H (1972) The relationship between the width of keratinized gingiva and gingival health. J Periodontol 43(10): 623-627.
12. Steiner GG, Pearson JK, Ainamo J (1981) Changes of the marginal periodontium as a result of labial tooth movement in monkeys. J Periodontol 52(6): 314-320.
13. Pritchard JF (1965) Advanced Periodontal Disease. W.B. Saunders Company, Philadelphia, USA, pp. 445-487.
14. Jin L (2007) Periodontic-orthodontic interactions-rationale, sequence and clinical implications. Hong Kong Dent J 4: 60-64.
15. Wennstrom JL, Lindhe J, Sinclair F, Thilander B (1987) Some periodontal tissue reactions to orthodontic tooth movement in monkeys. J Clin Periodontol 14(3): 121-129.
16. Diedrich P (2000) Periodontal relevance of anterior crowding. J Orofac Orthop 61(2): 69-79.
17. Proffit WR, Fields HW (2000) Contemporary Orthodontics. (3rd edn), St. Louis, Mo: CV Mosby, USA, p. 348.
18. Moyers RE, Dryland-Vig KW, Fonsece RJ (1988) Adult treatment. In: Moyers RE (Ed.), Handbook of Orthodontics. (4th edn), Year Book Medical Publishers Inc., Chicago, USA, pp. 472-510.
19. Brown IS (1973) The effect of orthodontic therapy on certain types of periodontal defects. I. Clinical findings. J Periodontol 44: 742-756.
20. Kessler M (1976) Interrelationships between orthodontics and periodontics. Am J Orthod 70: 154-172.

For possible submission use the below is the URL **Submit Article**

Your subsequent submission with Crimson Publishers will attain the below benefits

- High-level peer review and editorial services
- Freely accessible online immediately upon publication
- Authors retain the copyright to their work
- Licensing it under a Creative Commons license
- Visibility through different online platforms
- Global attainment for your research
- Article availability in different formats **(Pdf, E-pub, Full Text)**
- Endless customer service
- Reasonable Membership services
- Reprints availability upon request
- One step article tracking system