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Periodontal and Orthodontic Continuum: A Synergistic Approach

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ABSTRACT:

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I. INTRODUCTION

Periodontium consists of gingiva, periodontal ligament and cementum and alveolar bone that supports the teeth and helps in masticatory efficacy. Any external stimuli are able to affect this tissue and moderation of this stimuli can be utilized for person's benefit. Due to bacterial accumulation or plaque accumulation cause inflammatory response of body. When the gums are infected with bacteria for a period it can cause damage, to the bone that holds the teeth in place and result in the loss of tissue attached to the teeth. Periodontal disease has stages ranging from treatable gingivitis, to severe periodontitis that cannot be reversed.

From the perspective of a periodontist comprehending the extent of genetic alterations occurring in the ligament (PDL) due, to mechanical stimulation like orthodontic force can lead to new avenues, for collaborative research. This is because both periodontists and orthodontists work on the PDL at a level, where they observe host responses to inflammation. In regard to advancing technology, the number of patients undergoing orthodontic therapy is increasing day by day. These all patients have increased risk for plaque accumulation because of the poor oral hygiene maintenance because of the fixed orthodontic appliances on teeth.

The main goals of treatment typically focus on improving the appearance of teeth and face well as enhancing chewing ability. It is worth noting that there is a growing population of adult patients seeking care and its no secret that the prevalence of disease tends to rise with age. Consequently, there has been an increase, in the number of patients, with issues who are pursuing orthodontic treatments compared to previous years.

Both the Periodontist and the Orthodontist must possess an understanding of each other's areas of expertise in order to provide treatment, to patients. The most common motivating factor is to enhance facial and dental esthetics. A successful result of orthodontic treatment is largely affected by the patient's oral health status before, during and after active orthodontic treatment. Patients with periodontal problems need orthodontic treatment have to be treated in an interdisciplinary manner with Periodontist and Orthodontist delivering to a comprehensive treatment plan in correcting of the occlusion not only to prevent any further enhancement of the disease, but also to satisfy patient's functional and aesthetic demands.[1]

In many cases, a combined approach that integrates Periodontics and Orthodontics is essential for effectively treating and preventing further dental problems in patients."

Microbiology associated with orthodontic appliances

Bacterial plaque accumulation is the most common cause of periodontal disease, Nearly 500 different bacterial entities and various human viruses are interconnected with dental plaque. The

most common identified periodontal pathogens include three micro aerophilic species are Actinobacillus actinomycetemcomitans, Campylobacter rectus, and Eikenella corrodens and seven other anaerobic species named Porphyromonas gingivalis, Bacteroides forsythus, Treponema denticola, Prevotella intermedia, Fusobacterium nucleatum, Eubacterium, and spirochetes.

Changes found in microbiology around orthodontic bands[2]

1) Increase in number of Lactobacillus
2) Increase in motile organisms such as anaerobes and Prevotella intermedia
3) Decrease in number of facultative anaerobes

The response of periodontal tissue to different orthodontic forces and movements

Tooth movement, during treatment occurs when controlled forces are applied to the teeth. Removable appliances exert tipping forces while fixed appliances generate multidirectional forces that contribute to various types of movement including torquing, intrusion, extrusion, rotation and overall repositioning of the teeth.

Table 1: Response of the PDL to orthodontic forces

Strong Forces (>capillary blood pressure)	PDL destroyed on pressure side Local ischaemia degeneration of PDL Hyalinization late tooth movement
Moderate Forces (>capillary blood pressure)	Strangulation of PDL delay in bone resorption
Light Forces (<capillary blood pressure<20-25 mmHg)	Ischaemia in PDL, tooth movement continuous with simultaneous bone resorption and formation

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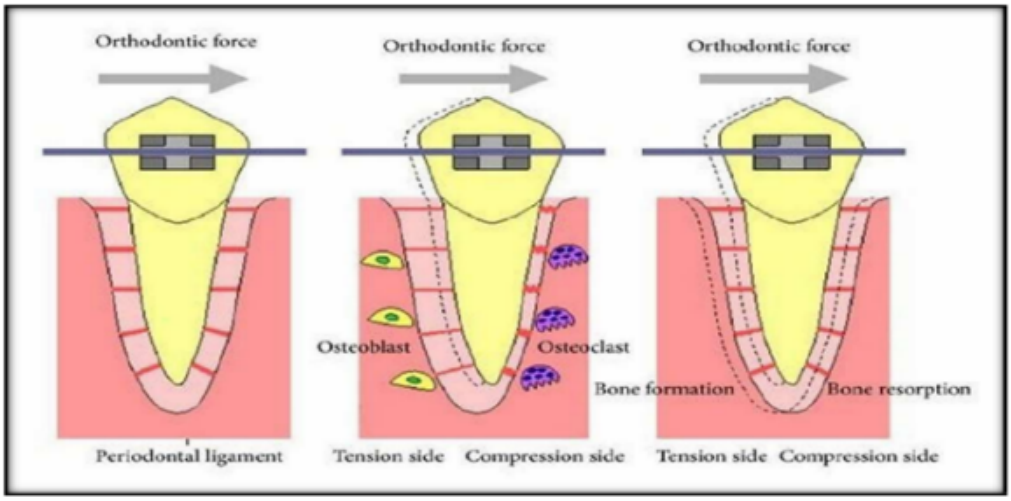

Figure 1. Periodontal tissue response to orthodontic forces

Bone surrounding a tooth having a force responds in the following manner: resorption occurs in pressure side and new bone formation in tension side.3

Course of Orthodontic & Periodontal Treatment

It is crucial to ensure coordination, between the Periodontist and Orthodontist when it comes to treating patients. In the case of treatment the Orthodontist should first assess if there are any issues and then refer the patient for a periodontal examination. It is more effective and precise to address problems before beginning orthodontic therapy. Other issues can be managed during treatment while certain periodontal concerns can be accurately treated after completing orthodontic therapy. The key to treatment lies in diagnosis and careful planning, by both the Periodontist and Orthodontist ensuring that each step is taken in the right order.4

1) Before orthodontic therapy

Some soft-tissue intricacies need to be handle before orthodontic therapy starts. Abnormal high frenum which attach at or near the free gingival margin of mandibular incisors and premolars have to be treated before orthodontic procedures. Mostly this teeth have lesser attached gingiva and need frenectomy and gingival grafting procedure to prevent clefting and gingival recession during orthodontics. Periodontal problems such as gingivitis should have periodontal therapy before orthodontic appliances are placed. Usually, improvement in oral hygiene habits and scaling are enough to create a healthy environment in most patients with gingivitis. A soft-tissue problem that need treatment before orthodontics is recession. Patients with pre-existing gingival recession may have underlying labial bony dehiscence. Having 1 mm or lesser gingiva, a gingival graft procedure required before orthodontic treatment to prevent further recession.

2) During orthodontic therapy

All adult patients must receive maintenance every six months either by their referring dentist or a periodontist. It is common for periodontal surgery to be recommended towards the end of treatment specifically to address any tissue abnormalities and enhance dental and facial aesthetics by correcting the anterior gingival margins. The surgical procedures such as gingivectomy in minor situations and apically positioned flaps to increase crown length in needful patients.

3). After orthodontic therapy

Once orthodontic appliances are withdrawn, patients with progressive bony problems have to follow a systematic program of maintenance, stabilization, occlusal adjustment and re – evaluation prior to restorative therapy. The frequency of recall interval with the periodontitis depends on the patient's response to curettage and level of oral hygiene maintenance.

Orthodontic Treatment for Periodontal Problems[5]

Orthodontic treatment can enhance both the look of the face and teeth as improve chewing ability, by aligning the teeth. However there are some drawbacks to consider such as decay, tooth staining and gum growth that may occur as a result of this treatment. Maintaining hygiene becomes challenging due to the presence of devices like braces and rubber bands. These factors can contribute to the build-up of plaque and alterations, in the types and composition of bacteria.

Some studies have suggested that there could be a connection, between malocclusion and periodontitis. However it has also been reported that there is no evidence to support the idea that orthodontic treatment positively affects health. Some researchers have mentioned improvements in plaque and bleeding indexes following treatment. Having issues does not necessarily mean that orthodontic treatment is not possible. Aligned teeth can contribute to maintaining or enhancing health. The ongoing confusion or debate surrounding the relationship, between treatment and periodontitis may stem from a lack of evidence.
Some Periodontal problems which are mentioned below which need orthodontic treatments are,

Soft tissue deformities:
1) Uneven Gingival margins
2) Open Gingival Embrasure
3) High Frenum attachment
4) Gingival recession
5) Gingival hyperplasia
6) Mouth breathing
7) Gingival recession

Hard tissue deformities:
1) Hemiseptal defects
2) Advance horizontal bone loss
3) Furcation Defects
4) Root Proximity

Periodontal Treatment for Orthodontic Problems[6]

It is crucial to avoid the teeth that have undergone treatment, from shifting to their original positions in order to achieve successful results. Several factors can lead to relapse, such as skeletal growth and tissue rebound following the removal of orthodontic appliances. Specifically rotated teeth have a tendency to revert back, to their treatment position once the braces are taken off.

Some Orthodontic problems which are mentioned below which need periodontal treatments are,

1) Supracrestal fiberotomy
2) Frenotomy / frenectomy
3) Removal of gingival invagination (clefts)
4) Gingivectomy
5) Surgical exposure of impacted teeth

Periodontally Accelerated Osteogenic Orthodontics (PAOO)

This PAOO technique was introduced by Dr. William Wilcko. It is also called WILCKODONTICS. Periodontally accelerated orthodontic (PAOO) is a treatment technique that involves a combination of alveolar corticotomy, particulate bone grafting and controlled orthodontic forces. This procedure takes advantage of the healing process, in bones known as the acceleratory phenomenon (RAP). By utilizing the PAOO procedure we can achieve an expansion of the alveolar bone width in a shorter treatment duration while also improving treatment stability and reducing apical root resorption. This technique has shown results.[7]

The regional acceleratory phenomenon (RAP,) which stands for Reactive Alveolar Process refers to the tissues response, to a stimulus that actually enhances the healing process of the affected tissues. It is characterized by an acceleration of activities. Specifically in the bone RAP causes an increase in the activation of multicellular units (BMUs) thereby expanding the space for remodelling. At a tissue level RAP leads to the formation of bone, with its disorganized pattern, which eventually transforms into lamellar bone during later stages.

After the teeth are moved the healing process of the sockets, in the bone triggers a response called RAP (Regional Acceleratory Phenomenon). This response is a result of the changes caused by orthodontic tooth movement leading to the creation of micro damage. The removal of these damages is crucial to prevent their accumulation and subsequent bone failure. Over time the adaptation, to this condition induced by orthodontics is facilitated by increased activation of BMU (Bone Modelling Unit) which eventually returns to normal levels within a few months.[8]

Technique modification

PAOO can be mostly combined with gingival augmentation procedures. This is for the adult who have significant gingival recession. In these condition a subepithelial connective tissue graft is placed over the denuded root surface with addition to particulate graft placement. The graft is obtained by removing a 1 to 2 mm thickness of gingival connective tissue from the elevated palatal flap.[9]
Orthodontics, Periodontics and Gingival Aesthetics[10]

Three undesirable aesthetic condition may develop during orthodontic treatment; [11]
1. Gingival margin discrepancies
2. The missing papilla
3. Gummy smile

II. DISCUSSION

Maintaining good gum health is crucial, for any treatment. It's important for adult patients undergoing treatment to receive oral hygiene instructions and periodontal maintenance to keep their gum tissue healthy. It is essential to monitor adults who have reduced support in their gums. To summarize tooth movement can be performed on both gums with root resorption and healthy gums as long as gentle forces are used gum inflammation is controlled and consistent oral hygiene practices are followed throughout the treatment. By understanding the collaboration, between periodontics and orthodontics the doctor can tailor the treatment plan according to the patients' needs and expectations.

Clinicians confronted with periodontal disease combine with superimposed malocclusions are one of the most difficult situations for making complex clinical decisions involving the both of periodontal and orthodontic therapies. The sequence as well as design of surgical procedures, choice of tooth movement and orthodontic mechanotherapy, are just some of the options available which must be kept in a mind and integrated.

III. CONCLUSION

The interdisciplinary therapies are founded in repeated clinical successful outcome that have provided patients with desirable dental and facial aesthetics, improved function and increased lifespan of their natural dentitions. Patients will continue to benefit from the combine approach of research and shared clinical information that the specialties of Periodontics and Orthodontics will provide.

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