Occlusal and Orthodontic Considerations in the Periodontally Involved Dentition

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In a periodontally involved dentition there is a quantitative reduction in the amount of supporting tissue. For this reason it becomes important to focus on the factors affecting the quality of this tissue. Plaque and occlusal trauma are universally recognized as the major factors affecting this quality with the emphasis strongly on the former.

As it is generally accepted that improper intra-arch alignment (form) can increase the potential for plaque accumulation and that improper interarch tooth contact relationship (function) may result in occlusal trauma, the need for a multidisciplinary approach to treatment becomes obvious. We have here a very striking example of the relationship between form, function and periodontal health. Poor tooth alignment often leads to unfavorable occlusal contacts and occlusal interferences. These in turn may result in unfavorable functional patterns and/or occlusal trauma. Occlusal trauma may magnify the periodontal breakdown with tooth migration as a possible sequela. A vicious cycle may thus be set in motion.

The traditional periodontal treatment approach has been to employ conservative and/or surgical procedures for the elimination of pockets and the restoration of normal gingival and bony architecture, hopefully maintained by proper home care.[1] We wish, in this paper, to reemphasize the need for minor tooth movement and selective grinding procedures as an integral part of the treatment of a periodontally involved dentition.

The Utilization of Orthodontics in Periodontal Therapy

Tooth malposition as a contributing factor in periodontal destruction and as an end result of periodontal disease has long been suggested. As early as 1930 Neustadt recommended the use of orthodontic therapy as an adjunct to the correction of periodontal disease.[2] Dummett in 1951 emphasized the areas in which orthodontic correction would be beneficial in the handling of periodontal pathology.[3] Many clinicians agree upon the importance of tooth position in the etiology of periodontal disease and advise utilization of a combined ortho-perio approach for correction of periodontal problems and maintenance of periodontal health.[4,5,6]

The Importance of Tooth Position for Self-Protection of the Periodontium

One of the most important factors in the maintenance of periodontal tissue health is the physiologic stimulation these tissues receive in normal function. A positive physiologic stimulation requires proper continuity and integrity of the arch. At the gingival level this means equal marginal ridge heights and closed interproximal contacts. This situation allows for the tight filling of the embrasures by the papillae, prevents food impaction, and reduces the chance for plaque accumulation.[7]

At the attachment apparatus level, a positive physiologic stimulation re-

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quires transmission of forces along the vertical axis of the tooth. This allows for maximum tensile forces and minimal compressive forces against the periodontal fibers. If the intensity, frequency and duration of these forces exceed physiologic limit, they may unfavorably alter a healthy attachment apparatus, as seen in cases of primary occlusal traumatism. The causitive factors are usually parafunctional in nature.

Teeth that have suffered progressive loss of attachment apparatus become less and less resistant to forces. When they can no longer resist normal physiologic forces, we have the condition of secondary occlusal traumatism[8,9] with all its untoward side effects.

One of the most important factors which determines the potential resistance to the transmission of forces is the tooth position in the arch. Optimal tooth position is that which allows for axial transmission of forces. Optimal conditions are met when: 1) occlusal surface is positioned over the center of the root and 2) occlusal table is 50-60% of the buccolingual width of the crown.

With gingival recession and subsequent reduction of the clinical root, the crown-root ratio is changed and the axis of rotation moves apically under the influence of horizontal forces. The attachment apparatus loss is magnified because of the conical shape of the root. The resistance of the remaining attachment apparatus to forces (especially horizontal) is greatly diminished.

Objectives of Orthodontic Treatment and Selective Grinding Procedures

The objectives of orthodontic treatment will be: 1) to bring teeth into proper alignment within the arch to protect the gingival tissue. This is accomplished by reducing the potential areas for food impaction and plaque accumulation. 2) to improve the position of malposed teeth to protect the attachment apparatus. This is accomplished by positioning the occlusal surface over the center of the root.

The objectives of selective grinding procedures will be: 1) to eliminate occlusal interferences, 2) to reduce the occlusal table to 50% of the buccolingual crown width, and 3) to reduce cuspal incline to lessen the load of lateral forces.[7,10]

The Response of the Periodontium to Orthodontic Procedures

Properly regulated forces applied during orthodontic tooth movement are transmitted to the periodontal ligament and stimulate cellular changes resulting in selective resorption and deposition of alveolar bone. This process is a rapid reproduction of what we see in physiologic tooth migration, but with control of the amount and direction of movement.[11] An attempt to apply this physiologic phenomenon, via tooth movement, to fill osseous defects has been utilized by several research workers with encouraging results. Gerasi[12] artificially produced osseous defects of the 2 and 3 wall type in the rhesus monkey. He demonstrated that movement into the area of the defect resulted in healing and regeneration of bone. Similar regeneration was documented by Brown,[6] who suggests that "there is potential for reduction in pocket depth, increase in attachment apparatus and change in the architecture of both the hard and soft tissues of the periodontium."

The same biologic phenomenon, applied in a different plane of space, is observed in passive tooth eruption which is accompanied by compensatory bone deposition in the fundic area and the crest of the alveolus.[13] This simultaneous addition main-

tains a relatively constant height of the alveolar crest in relation to the cemento-enamel junction. Forced tooth eruption by orthodontic means, incorporating this phenomenon, has been used for many years to bring unerupted teeth into place. A further extension of this same principle has recently been applied to correct isolated one or two walled infrabony osseous defects.[14]

Orthodontics, therefore, offers, in addition to improved tooth position for better periodontal health, the opportunity for improvement and correction of osseous defects.[15-17]

The Need for a Multidisciplinary Approach

Rehabilitation of detentions with advanced periodontal disease is a complicated treatment procedure which requires skills in several disciplines of dentistry. The functional, esthetic and posttreatment stability demands of each case dictate the need for a team approach including periodontist, orthodontist and prosthodontist. There must be an agreed upon treatment plan by all disciplines involved with treatment objectives and limitations clearly understood.

During the orthodontic phase of treatment this cooperation is called into play for the identification and elimination of two major detrimental factors, inflammation and trauma.

In the presence of inflammation, orthodontic tooth movement will not bring about positive changes in the periodontium. In fact, several clinicians have shown that in the presence of inflammatory periodontal disease, tooth movement may actually cause a deepening of osseous defects.[18] It is clear that routine periodontal treatment and good oral hygiene to prevent inflammation are absolute necessities during orthodontic procedures. Many clinicians believe that occlusal trauma has a catalytic effect upon the progression of periodontal disease,[18,20,21] therefore occlusal adjustment by selective grinding is most important before and during orthodontic movement to eliminate occlusal interferences. These interferences are the causative factor of occlusal trauma. The histologic, radiographic and clinical manifestations of occlusal trauma have been documented long ago.[19]

Summary

In the formulation of a treatment plan for patients with advanced periodontal disease, we must consider the benefits that orthodontics can supply. By improving the position of malposed teeth, we create a better environment for the health of the gingivae and attachment apparatus, as well as the possibility of improving osseous defects as the result of orthodontically stimulated osteogenic activity.

The ultimate goal of treatment must be, in addition to control of inflammation, plaque and trauma, the creation of optimal morphologic and functional conditions which will allow these objectives to be obtained. This will provide the prosthodontist and periodontist a better chance to prolong the life of the dentition.

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