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Wilckodontics-Accelerated Osteogenic Orthodontics and Piezocision

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ABSTRACT

The trend in orthodontics over the past several decades has been to improve the treatment for patients through advances in metallurgy and chemistry. This can be seen in the evolution of arch wires, bands, brackets, cements, and bonding materials. These advances have improved the manner and efficiency with which the orthodontic forces are transferred to the crowns of the teeth. But in spite of all these advances most conventional fixed orthodontic treatments still require 1½ to 3 years to complete.The AOO (Accelerated osteogenic orthodontics) procedure has solved this dilemma by exploiting the dynamic of bone physiology and redirecting the emphasis in tooth movement to the manner in which the supporting bone responds to orthodontic forces rather than just concentrating on the manner in which the forces are applied to the teeth. By stimulating and harnessing the innate potentials of living bone the teeth can be made to move through the bone very rapidly and when the tooth movement is completed the bone around the roots of the teeth will rebuild itself. By this procedure teeth can be moved approximately 4 times faster than with conventional orthodontics. As a result, the treatment time for most orthodontic cases can be reduced to 3 to 8 months.

KEYWORDS: Wilckodontics, malpositioned teeth, orthodontic treatment, periodontal disease, accelerated osteogenic orthodontics.

Introduction

Malpositioned teeth are responsible for esthetic and occlusal aberrations in many adults. Malocclusions may be caused by several factors, including the spread of advanced periodontal disease, dental migration towards areas of tooth loss, and tooth movement produced by traumatic occlusal problems. However, patients often forgo orthodontic treatment because of its long duration.[1]

Traditional orthodontic movement is the result of periodontal ligament compression, which produces histologic and biomolecular modifications of the periodontal tissues that activate dynamics of crestal bone resorption and apposition. Thus, orthodontic movement is considered a "periodontal phenomenon" because all the periodontal tissues are involved. [1]

For this reason preservation of the integrity of the periodontium is generally difficult to achieve and is associated with a long duration of treatment. Although traditional orthodontic therapy is the gold standard for treating many adult malpositions, it can be problematic when applied to patients of thin periodontal biotype, who may experience root dehiscence and/ or recession. [1]

Historical perspective

Orthodontic treatment usually lasts 1 to 2 years, and even more time is required for extraction cases. To shorten the time of orthodontic tooth movement, various attempts have been made. These attempts fall into three categories. The first is local or systemic administration of medicines. [2] The second category is mechanical or physical stimulation such as direct electrical current[3] or a samarium-cobalt magnet.[4] The last category is oral surgery, including dental distraction, alveolar surgeries to undermine interseptal bone,[5] and alveolar corticotomies, which have been used to correct malocclusions over 100 years. [2]

Kole H (1959) used a combined interradicular corticotomy and supra-apical osteotomy technique for rapid tooth movement. Duker J in 1975, duplicated Kole's technique in a report of alveolar corticotomies using beagle dogs. By using only labial and lingual corticotomy cuts to circumscribe the roots of the teeth, Generson et al in 1978 revised Kole's technique and reported successful results with a 1-stage corticotomy-only technique without the supra-apical osteotomy. Gantes et al in 1990 also reported rapid tooth movement and reduced treatment time. [2]

Hajji SS (2000) reported that the active orthodontic treatment periods in patients with corticotomies were 3 to 4 times more rapid compared with patients without corticotomies. It was believed that a corticotomy makes tooth movement faster because the bone block moves with the tooth. [6] However, tooth movement after a corticotomy should be considered a combination of classical orthodontic tooth movement and the movement of bone blocks containing a tooth, because the force applied to a tooth is transmitted into the osteotomy gap through the periodontal ligament. [7]

In 2001, Wilcko et al reported a revised corticotomy-facilitated technique that included periodontal alveolar augmentation, called periodontally accelerated osteogenic orthodontics; it demonstrated acceleration of treatment to one third of the usual time. 8 Wilcko et al mentioned, in cases of rapid orthodontics with corticotomies, that corticotomies could increase tooth movement by increasing bone turnover and decreasing bone density. [9]

Wilckodontics/ Accelerated Osteogenic Orthodontics Technique (Fig 1)

The periodontally accelerated osteogenic orthodontics (PAOO) also termed as Wilckodontics, involves full-thickness labial and lingual alveolar flaps accompanied with limited selective labial and lingual surgical scarring of cortical bone (corticotomy). [10]

Fig 1a. Microtomy is performed around each tooth root

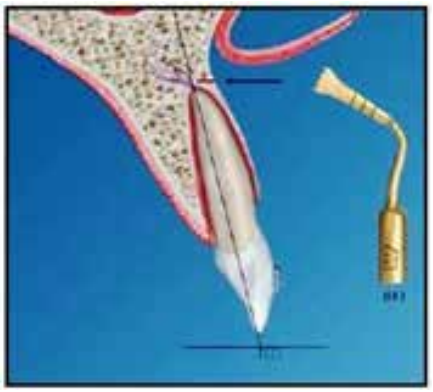

Fig 1b. Periapical horizontal corticotomy is performed with the piezosurgery

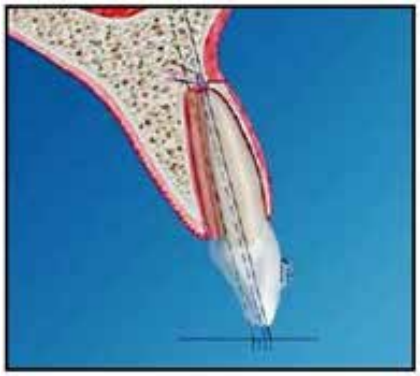

Fig 1c. Buccal monocortical tooth palatal ligament distraction movement dislocation

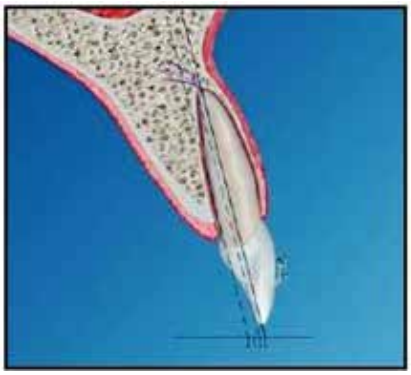

Fig 1d. After healing there is no modification in crestal bone thickness on the buccal side and the palatal side is augmented

Demineralization of a thin layer of bone over a root prominence after corticotomy surgery can optimize the response to applied orthodontic forces. When combined with alveolar augmentation, one is no longer strictly at the mercy of the original alveolar volume, and osseous dehiscences & fenestrations can be corrected over vital root surfaces. This is substantiated with computerized tomographic and histologic evaluations. 11 The therapy concludes with the application of conventional orthodontic movement.

The accelerated osteogenic orthodontics technique provides for efficient and stable orthodontic tooth movement. Frequently, the teeth can be moved further in one third to one fourth the time required for traditional orthodontics alone. This is a physiologically based treatment consistent with a regional acceleratory phenomenon and maintaining an adequate blood supply is essential. [11]

PAOO is an effective treatment approach in adults to decrease treatment time and reduce the risk of root resorption. Selected corticotomy limited to the buccal and labial aspects also significantly reduces treatment time. [12]

Historical perspective on Piezocision

Vercellotti & Podesta (2007) introduced the use of Piezosurgery in conjunction with conventional flap elevations to create an environment conducive to rapid tooth movement. 1 Although quite effective, these techniques are also quite invasive in nature, since they require extensive flap elevations and osseous surgery. They have potential to generate postsurgical discomfort as well as postoperative complications. Because of these shortcomings, these techniques have not been embraced widely by patient or dental communities. [13]

Park et al [14] and Kim et al [15] introduced the corticision technique as a minimally invasive alternative to create surgical injury to the bone without flap reflection. This technique involves the use of a reinforced scalpel and a mallet to go through the gingiva and cortical bone without raising a flap buccally or lingually. The surgical injury created is enough to induce the regional acceleratory phenomenon effect and move the teeth rapidly during orthodontic treatment.

This technique, although innovative, has two drawbacks: the inability to graft soft or hard tissues during the procedure to correct inadequacies and reinforce the periodontium, and repeated malleting, which may cause dizziness after surgery. A new minimally invasive technique was developed by Dibart et al (2010) known as Piezocision, which involves microincisions with selective tunnelling that allows for hard and soft tissue grafting and piezoelectric incisions. [13]

Piezocision

Piezocision allows rapid orthodontic tooth movement without the down sides of the extensive and traumatic classical surgical approach. This technique will best benefit patients with moderate to severe Class I malocclusions for which the teeth are intended to be moved buccally to resolve crowding or to expand the arch in needed direction. This is particularly significant in patients demonstrating a flat or concave soft tissue profile, for which extraction to resolve crowding would be detrimental and where buccal protrusion of the anterior segment might improve esthetics. Dental crossbites requiring buccal tipping of the maxillary teeth could be corrected orthodontically following piezocision without the risk of dehiscence/ fenestration because of concomitant bone grafting. The procedure strengthens the periodontium while cutting down treatment times drastically (ideal for adult patients with time limitations). [13]

Although very useful and versatile, piezocision is not a "cure for all" and does not in any case replace conventional orthognathic surgery for the treatment of skeletal malocclusions, where the movement of the skeletal base is necessary. Piezocision proves to be efficient from the standpoint of the patients and clinicians and offers advantages that should lead to greater acceptance on dental and patient communities. [13]

Conclusion

The accelerated osteogenic orthodontics technique provides for efficient and stable orthodontic tooth movement. Frequently, the teeth can be moved further in one third to one fourth the time required for traditional orthodontics alone. This is a physiologically based treatment consistent with a regional acceleratory phenomenon and maintaining an adequate blood supply is essential.

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