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The Concept of a New Dental Disease: Orthodontosis and Orthodontitis

Abstract

Introduction: Angle's 110 year old classification of malocclusion lacks verifiable scientific validity, and lacks substantiation on whether ideal occlusion significantly improves oral function or provides significant benefits in oral or general health. We propose a new orthodontic classification based on evaluating the position of roots and location of bone in the horizontal dimension.

Materials and Methods: Thousands of completed orthodontic cases, with an overwhelming majority treated non-extraction were subjected to photographic and radiographic evaluation. Based upon this we propose new orthodontic classifications of

a. Orthodontosis, defined as the non-inflammatory deficiency of the alveolar bone in the horizontal dimension caused by the displaced root(s) of the tooth, typically palatally or lingually.

b. Orthodontitis defined as excess soft tissue manifestation and chronic inflammation.

Discussion: To date, a link between malocclusions and periodontal condition remains unclear and controversial. With this new classification patients will be diagnosed and treated accordingly based on their own individual genetic and morphologic appearance rather than an arbitrary ideal.

Conclusion: A new orthodontic classification namely Orthodontosis and Orthodontitis is proposed for malpositioned teeth based on the clinical morphology, appearance and contour of the alveolar bone and ridge. This new classification, as a replacement of or as a supplement to traditional classifications may lead to more non- extraction orthodontic therapeutic modalities.

Keywords: Orthodontitis; Orthodontosis; Dentistry; Orthodontics; Periodontics; Braces

Research Article

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Anthony D Viazis[1], Evangelos Viazis[2] and Tom C Pagonis[3]*

[1]*Orthodontist, Private Practice, USA*
[2]*Private Practice, Greece*
[3]*Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, USA*

***Corresponding author:** Tom C Pagonis, Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, MA 02115, USA, Tel: +1617-432-5846; Fax: +1617-432-0901; Email: tom_pagonis@hsdm.harvard.edu

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Abbreviations

PAR: Peer Assessment Rating; IOTN: Index of Orthodontic Treatment Need; OHP: Oral Health Promotion; TBI: Tooth Bone Interface; OTM: Orthodontic Tooth Movement; PDL: Periodontal Ligament

Introduction

A critical prerequisite for orthodontic treatment is the understanding of and classification of malocclusion. Currently there are several classifications of malocclusion which include classic qualitative methods such as Angle [1] and more contemporary quantitative methods and indices such as Peer assessment rating (PAR) and Index of orthodontic treatment need (IOTN). First developed in 1899, Angle's classification [2] has remarkably endured the test of time and continues to be utilized as the main language of malocclusion among orthodontic specialists. Yet, there continues to be an emerging body of literature that exposes the lack of evidence for this conventional classification of malocclusion in Class 1 (ideal), II or III. Graverly and Johnson [3] showed poor diagnostic inter-provider reliability while Siegel's survey study [4] among 34 chairpersons of Orthodontics Departments in the U.S. showed that fewer than 65% were in agreement on the meaning of a Class II sub-division. An editorial published in the American Journal of Orthodontics in 2009 [5] stated that, although the concept of ideal occlusion has taken precedence as the ultimate goal in clinical orthodontics for some 110 years and serves as an adopted arbitrary method convention and clinical gold standard, it has no verifiable scientific validity, and that no one has yet demonstrated that ideal occlusion provides significant benefits in oral or general health, or that it significantly improves oral function. Rinchuse and Rinchuse [6] also question the arbitrary nature of this classification that suggests a change in a stable, functional mandibular position in order to achieve a morphologic occlusion that conforms to an arbitrary ideal.

It is estimated that the teeth are in contact for less than 20 minutes per day [7]. Why then should a dentist base his/her diagnosis of a patient's malpositioned teeth on the occlusion and not on the alveolar bone that is a constant 24 hours a day? Why shouldn't the same principles that apply to the evaluation of the bone and roots in the vertical dimension utilized in the field of Periodontics also apply to the field of orthodontics in the horizontal dimension? Clinical observations after two decades of orthodontics practice leads us to propose the establishment of a new classification for malpositioned teeth based on the clinical morphology and appearance of the alveolar bone and ridge. This classification is a paradigm shift from the traditional orthodontic thinking and more in line with the current accepted theories found in the periodontal literature and the specialty of Periodontics.

Materials and Methods

Thousands of completed orthodontic cases, with an overwhelming majority treated non-extraction over a span of two decades of clinical practice utilizing a system of braces that upright the roots from the beginning of treatment [8-21] were subjected to photographic and radiographic evaluation. Clinical observation leads us to propose the establishment of a new classification for malpositioned teeth based on the clinical morphology of the alveolar bone and ridge:

Localized orthodontosis

This term replaces the old Angle term of Class I ideal occlusion. This condition typically has an overbite/overjet relation of 2-3mm which is adequate for anterior guidance. Orthodontosis is the non-inflammatory deficiency of the alveolar bone in the horizontal dimension caused by the displaced root(s) of the tooth, typically palatally or lingually. This results in excess soft tissue and chronic inflammation called Orthodontitis. Once the root is upright then the alveolar bone is restored and the Orthodontitis (the gingivitis from malpositioned teeth) is alleviated (Figure 1-5).

Premaxillary orthodontosis

This term replaces the old Angle term of Class II malocclusion. These types of cases typically demonstrate flared upper anterior teeth and a premaxilla that seems underdeveloped as the roots of the upper anterior teeth did not erupt to their full upright potential. As a result, the overbite/overjet relation is excessive. Upper interproximal reduction molar to molar can easily help alleviate this condition and restore the alveolar bone to the level it should have always had. If the patient also demonstrates mandibular retrognathia, then a surgical procedure may also be indicated (Figure 6).

Mandibular orthodontosis

This term replaces the old Angle term of Class Ill malocclusion. These types of cases typically demonstrate minimal overbite/ overjet with retro lined lower incisors or negative overjet (underbite). Apart from a slight maxillary deficiency, these cases show excess alveolar bone and/or basal bone formation with retro lined incisors. Lower interproximal reduction molar to molar can alleviate this condition for up to three lower anterior teeth in underbite relation. If more teeth are in anterior crossbite then a surgical procedure may also be indicated (Figure 7).

Discussion

Periodontic orthodontic interrelationships

Generally, treatment planning of orthodontic care is based primarily on the premise of improvements of function, dental and facial esthetics and general dental health. Yet, a link between malocclusions and periodontal condition remains unclear and

Figure 1: Localized orthodontosis replaces the old term of class I ideal occlusion.

Figure 2: Brackets applied initially only on teeth with orthodontosis of the alveolar bone.

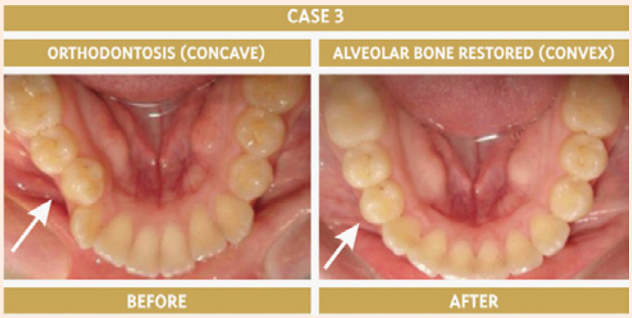

Figure 3: Orthodontosis in the right mandibular premolar area. Orthodontosis is the deficiency of alveolar bone in the horizontal dimension caused by the displaced root(s) of the tooth, typically palatally or lingually.

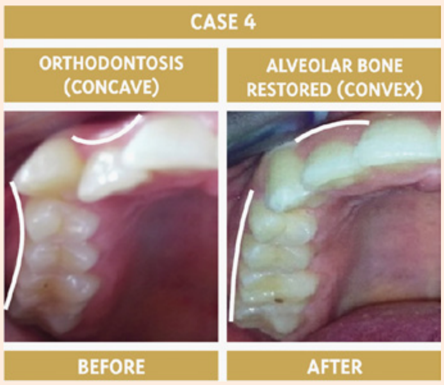

Figure 4: The maxillary right premolars and maxillary right lateral incisor have orthodontosis. The canine tooth should be bracketed after the lateral and premolar roots have up righted in order for the alveolar bone to be restored beforehand.

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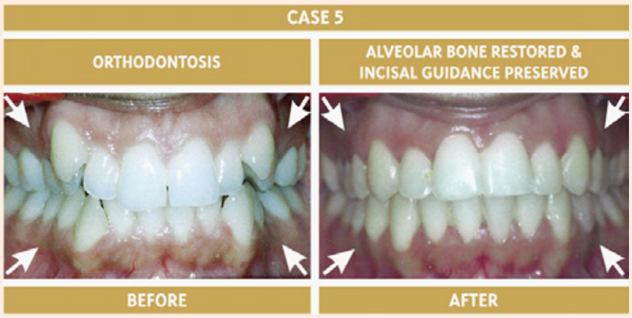

Figure 5: The deficiency of the alveolar bone morphology by the first premolars is restored after their roots orthoerupted in their upright position. Non-extraction therapy restores the mouth to its natural dental arches as if the teeth erupted normally to these positions in the first place.

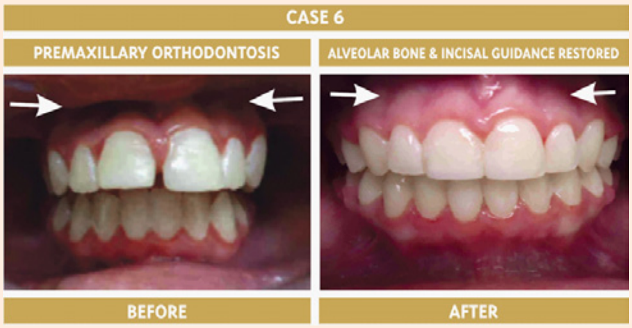

Figure 6: Premaxillary orthodontosis replaces the old term of class II.

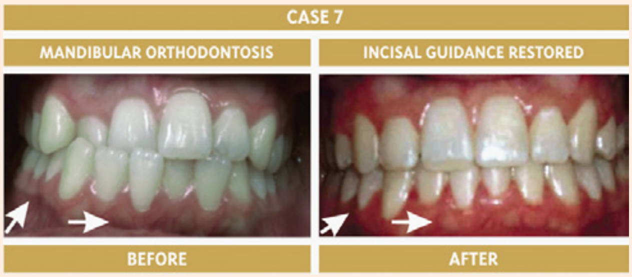

Figure 7: Mandibular orthodontosis replaces the old term of class III.

controversial at best. Van Gastel et al. [22] findings in a literature review on the impact of malocclusion and orthodontic treatment of periodontal health does not show a clear correlation. Furthermore, a systematic review by Gray and McIntyre [23] shows a positive association of orthodontic care and periodontal health by quantifying the impact of orthodontic oral health promotion (OHP) which produced a reduction in plaque with an improvement in gingival health.

Microbial sub gingival plaque composition of malpositioned Vs non-malpositioned teeth

Our proposed classification of malpositioned teeth by the evaluation of alveolar bone and roots in the horizontal dimension is consistent with differences found in the microbial composition of sub gingival plaque of malpositioned Vs non-malpositioned teeth. While several factors contribute to the microbial colonization of dental plaque including pH, temperature and osmotic pressure [24-28], physical barriers to self-cleansing caused by malpositioned teeth facilitate the accumulation of plaque and its microbial constituents [29]. Chung et al. [30] concluded that compared to non-malpositioned anterior dentition in adults, malpositioned anterior dentition exhibited greater plaque accumulation, a greater number of periodontopathogens present in sub gingival plaque with a significantly more common presence of Fusobacterium species, Capnocytophaga species, C rectus and P micros. In addition, a study by Thornberg et al. [31] examined levels of eight periodontal pathogens, Actinobacillus actinomycetemcomitans, Eikenella corrodens, Fusobacterium nucleatum, Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia, Treponema denticola, and Campylobacter rectus on adolescents pre operatively, peri operatively and post operatively. They concluded that orthodontic treatment had a positive effect post treatment and protective for four of the pathogens, namely Eikenella corrodens, Fusobacterium nucleatum, Treponema denticola, and Campylobacter rectus.

Current concepts of tooth eruption

The formation of the human tooth represents a complex participation of various cell/tissue types involving interactions between ectoderm and neural-crest-derived mesenchyme [32,33]. A process of differentiation ultimately gives way to the development of a functional unit which includes the tooth and surrounding periodontal tissue (i.e. alveolar bone, periodontal ligament) [34]. The area between the alveolar bone and tooth cementum, which has been referred to as the tooth-bone interface (TBI) [35], houses the soft tissue of the periodontal ligament in a developed and functional tooth. During the development of a tooth crown the TBI creates space for the developing tooth to grow while providing a soft tissue space for periodontal ligament formation during root development. While the TBI possesses an osteogenic potential [36,37] it is essential that the space remain free from mineralization in order to prevent ankylosis of the developing tooth and root. This appears to involve the coordinated action of osteoclasts. The impaired function of osteoclasts in the adjacent tooth-bone interface would cause alveolar bone growth into the space, impaired development of the growing tooth germ and primary failure of eruption in humans [38]. Therefore the regulation of osteoclastogenesis plays a critical role by providing a clear path in bone for tooth eruption and root formation [39].

Eruption of a developing tooth crown begins with root development by the movement of the crown away from the point of initial root development [29]. Eruption requires the fulfillment of two criteria:

i. A force must be initiated to move a tooth along a certain eruption path

ii. The resorption or elimination of primary tooth roots.

Many theories of eruptive movement have been proposed including force from cellular proliferation at the root apex and

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variation in blood flow or pressure in the periodontal ligament [40]. Fundamentally, the process of tooth movement in an eruption path remains unclear [41].

Orthodontic tooth movement (OTM) and accompanying bone remodeling processes are caused by varying changes in the stress/strain distribution in the periodontium caused by intra-alveolar movement of the roots. The mechanical stimulus provided by the moving roots translates into a biological response which is termed mechanotransduction [42]. Commonly accepted theories of tissue reaction to orthodontic forces include:

i. The pressure-tension theory which refers to the alteration in blood flow associated with pressure within periodontal ligament (PDL) causing activation of PDL cells and bone remodeling [43].

ii. The "bioelectric" theory which attributes tooth movement to changes in bone metabolism initiated with the deformation of alveolar bone and controlled by electrical signals [44].

While utilizing a finite element model, Cattaneo et al. [45] showed that alveolar bone remodeling can't be based on the above referenced theories which contemplate simplified but generally accepted concepts of resorption from compression and bone formation by tension forces.

The new concept of "orthoeruption"

Up righting the roots of malpositioned teeth from the beginning of orthodontic treatment represents a new theory of orthodontic tooth movement after completion of tooth eruption. Based upon generally accepted concepts of resorption from compression and bone formation by tension forces, this new technology of orthodontic tooth movement contemplates that light forces may possibly stimulate bone remodeling around the area of displaced roots. This would allow for the up-righting of displaced roots into a straight position as if the tooth erupted in that position; thus we propose the term "orthoeruption". Orthoeruption results in the alveolar bone remodeling and restoration of the dental arch to its appropriate natural size and shape for each specific mouth. Accordingly non-extraction therapy is almost always achieved through this bone "growth" remodeling as the alveolar bone reacts to a tooth erupting in its correct place in the arch and follows accordingly. The accompanying bracket technology attempts to deliver very light forces to simulate the low force eruption stimuli that is possibly needed to allow for bone remodeling around the displaced root area of the alveolar bone and thus achieve correction of root position.

Furthermore, the authors believe that orthodontic diagnosis based on the morphology of the alveolar bone accepts the patient's natural dentition within its own hard tissue and soft tissue substrate. Therefore patients are simply diagnosed and treated accordingly based on their own individual genetic and morphologic appearance and not based on arbitrary ideals. As a result of the proposed new concept, people's faces all over the world are accepted de facto and would not be subject to alteration from extractions that would mutilate the natural facial and alveolar morphology. For example, a patient with bimaxillary protrusion would be accepted as normal and natural for that specific individual. If that individual wishes any facial alteration of their alveolar appearance beyond a straight smile then the authors believe that belongs under the realm of periodontal/oral maxillofacial and or plastic surgery.

Conclusion

Thousands of completed orthodontic cases, with an overwhelming majority treated non-extraction utilizing a system of braces that upright the roots from the beginning of treatment were subjected to photographic and radiographic evaluation. Based upon this large body of clinical observation, a new orthodontic classification namely Orthodontosis and Orthodontitis is proposed for malpositioned teeth based on the clinical morphology, appearance and contour of the alveolar bone and ridge. This new classification, as a replacement of or as a supplement to traditional classifications may lead to more non extraction orthodontic therapeutic modalities.

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The Fallacy of Tongue Thrust and Non-Surgical Treatment of a Severe Anterior Open Bite

Abstract

Introduction: The causal relation between tongue thrust swallowing or habit and development of anterior open bite continues to be made in clinical orthodontics yet studies suggest a lack of evidence to support a cause and effect. Treatment continues to be directed towards closing the anterior open bite frequently with surgical intervention to reposition the maxilla and mandible. This case report illustrates a highly successful non-surgical orthodontic treatment without extractions.

Case report: After seeking treatment options since the age of 12 and undergoing several unsuccessful attempts to close her anterior open bite, the patient who is a dentist presents at the age of 33 and successfully completes non-extraction orthodontic treatment in 15 months. Post treatment results show a dramatic closure of the anterior open bite and proper intercuspation of teeth with a proper over jet and overbite relation. A stable occlusion without an anterior overbite relapse is maintained at a two-year recall visit.

Conclusion: Tongue thrust swallowing as a cause of an anterior open bite appears more a fallacy than a direct cause. This case report illustrates the potential of non-extraction orthodontic therapy with a system of braces that utilizes light forces and moves the tooth roots toward their final position from the onset of treatment in a short of amount of time from weeks to months.

Keywords: Anterior open bite; Tongue thrust; Non-extraction orthodontic treatment

Case Report

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Anthony D Viazis[1], Evangelos Viazis[2] and Tom C Pagonis[3]*

[1]Orthodontist, Private Practice, Dallas, Texas, USA

[2]Private Practice, Athens, Greece

[3]Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, Boston, MA, USA

***Corresponding author:** Tom C Pagonis, Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, MA 02115, USA, Telephone: + 1 617-432-5846; Fax: + 1617-432-0901; Email: tom_pagonis@hsdm.harvard.edu

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Introduction

The anterior open bite remains one of the most challenging cases to treat in orthodontics. It is characterized by a negative overbite or lack of a proper overbite relation of maxillary and mandibular incisors with posterior teeth in occlusion. The prevalence of an anterior open bite varies with age and among ethic groups and ranges from 1 to 11.5% [1-3]. The etiology of open bite remains uncertain [4,5] with numerous theories of development that include tongue function, digital habits, heredity and unfavorable patterns of growth [6]. In addition, some studies suggest a correlation between a weakened musculature and a long face anterior bite pattern [7]. One of the most debated theories of open bite development particularly in the classic literature and with a reported wide variation in prevalence is tongue thrust swallowing [8-10]. Tongue thrust is considered a normal physiological manifestation of suckling and also occurs in transitional dentition but typically disappears with the establishment of a normal anterior overbite [10]. The tongue thrust diagnosis is still prevalent and treatment is directed towards closure of the associated anterior open bite frequently with surgical intervention to reposition the maxilla and mandible with adjunctive treatment involving tongue reeducation [11,12]. Other treatment modalities include the use of micro implant anchorage complemented by genioplasty along with multiple jaw surgeries with dental implants for cases with missing teeth [13,14]. Classic non-surgical interventions which include extraction therapy or multi-brackets with fixed habit correcting appliances and high-pull therapy often result in marginal skeletal and occlusal improvements [15- 18]. Advances in mechano therapy, orthodontic diagnosis and treatment concepts have nearly eliminated the need for surgical intervention and multiple tooth extractions for correction of an anterior open bite. Viazis et. al. [19] has proposed new diagnostic terms of orthodontosis and orthodontitis as a replacement to the widely used, arbitrary and scientifically unverified Angle classifications of I, II and III. The central paradigm of these new diagnostic terms is based on the theory that malpostioned teeth and the clinical manifestation of an anterior open bite represent unfinished tooth eruption. This system of braces known as Fastbraces® simplifies the diagnostic and treatment process significantly. The treatment is based on the non-extraction mechanically aided continuation of eruption by mimicking the lighter natural forces of tooth eruption. The following case report illustrates the successful long term treatment outcome of a severe anterior open bite and challenges the diagnosis of tongue thrust as its cause.

Case Report

The patient is a 33-year old female dentist who presents to the treating co-author's private practice in Athens, Greece with a chief complaint of an open bite and poor posterior occlusion (Figure 1). As a 12-year old child growing up in Serbia, the patient accompanied by her parents first presented to the private family dentist for evaluation and treatment. She was diagnosed with a skeletal open bite secondary to a "tongue thrust problem" which her dentist described as continuous suckling. She was given a series of removable habit correcting appliances which she used as instructed but tapered herself off in about a year because treatment was ineffective. Several years passed before the patient returned to a public dentist (state run health and dental care) for treatment at the age of 19 where she was given removable orthodontic/orthopedic appliances followed by application of brackets prior to surgical orthodontic treatment. Once again her anterior open bite was attributed to tongue thrust. Because of the uncertain outcome and difficulty associated with the surgical orthodontic procedure as described by her dentist and surgeon she decided not to pursue treatment and brackets were removed. Shortly thereafter she started dental school where she was seen by a professor in the department of orthodontics. She was told that surgical orthodontics was the only viable treatment option but was once again cautioned of the difficulty and uncertain outcome of the procedure. She once again decided to forgo surgery and all orthodontic treatment for several years.

Figure 1(A): Pre-treatment facial and intra-oral frontal view photographs.

Figure 1(B): Pre-treatment intra-oral occlusal view photographs.

Treatment objective

On examination the patient has a mesoprosopic face with an anterior open bite of 8 mm with end to end occlusal contacts of first molars and stable second molar occlusion. After review of pretreatment panoramic and lateral cephalogram radiographs the patient was treatment planned for non-surgical, non-extraction orthodontic treatment to eliminate the anterior open bite and correct associated malocclusion by utilizing the bracket system, Fastbraces ® (Figure 2).

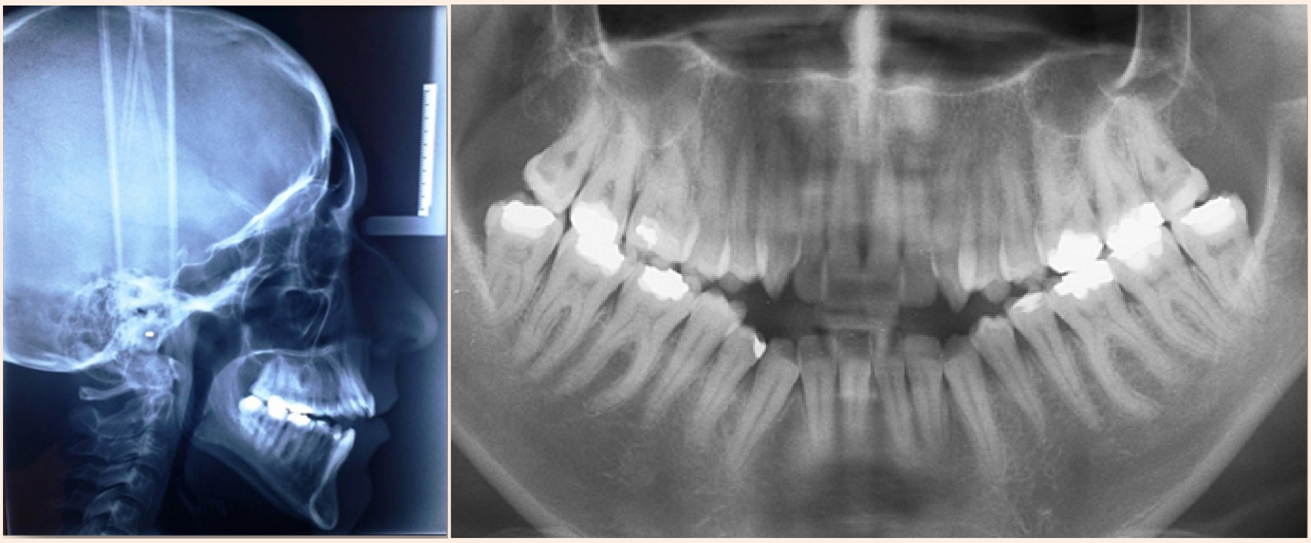

Figure 2: Pre-treatment lateral cephalogram and panoramic radiographs.

Treatment progress

Treatment took 15 months with appointments scheduled approximately on a monthly basis. Brackets were initially placed on the four maxillary incisors for patient comfort for one month. At the second appointment brackets were placed on all remaining maxillary teeth including the properly occluding second molars. This set up provided appropriate force and adequate torque for both the maxillary first molars and all premolar roots to upright and aligns the maxillary arch by inducing alveolar bone growth in order to provide proper occlusion with opposing mandibular teeth. At the third visit and three months into treatment, brackets were placed on the mandibular teeth with elastics to close the anterior bite. The treating co-author notes that treatment time could have been substantially less had the patient diligently complied with the use of elastics.

Treatment results

Clinical results along with photographs and radiographs comparing pre and post treatment show dramatic closure of the anterior open bite, a stable occlusion with alignment of roots in a treatment time of 15 months (Figure 3 & 4). Overjet and overbite was measured at 2 mm and normal intercuspation of teeth was achieved. At a two-year follow-up visit the patient maintained stable occlusion, proper overjet/overbite relation without relapse of an open bite (Figure 5).

Figure 3(A): Post-treatment facial and intra-oral frontal view photographs.

Figure 3(B): Post-treatment intra-oral occlusal view photographs.

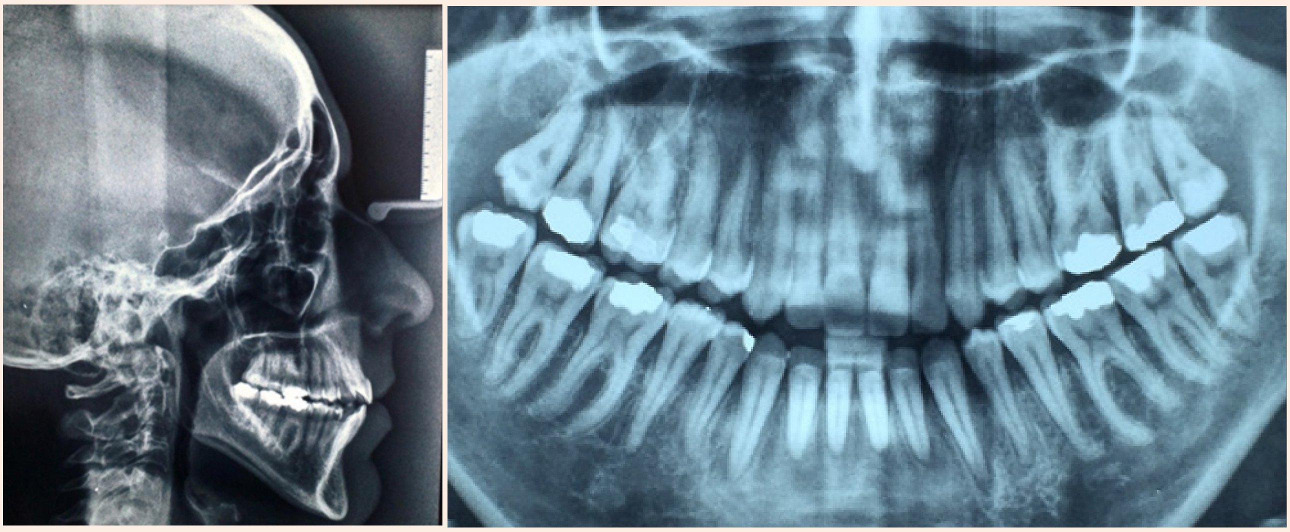

Figure 4: Post-treatment lateral cephalogram and panoramic radiographs.

Figure 5: Two-year post-treatment follow-up, intra-oral frontal view.

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Discussion

Tongue thrust swallowing and development of an anterior open bite have been and continue to be associated yet the relationship between the two remains unclear. There is evidence to suggest that an anterior tongue position may prevent anterior teeth eruption but that tongue thrust swallowing is an adaptive mechanism to an open bite in order to maintain an anterior seal rather than it's cause [10,20]. The main treatment objective with this clinical presentation should be to close the anterior open bite thereby correcting the functional tongue thrust.

There are limitations with traditional orthodontic systems which greatly influence treatment planning towards a combination of mechanotherapy and surgical orthodontics for a severe anterior open bite. Many patients wish to forgo the risks and possible complications of surgical treatment and opt for a non surgical solution which is more difficult especially for long term stability and retention [20]. Most often traditional orthodontic therapy in these cases will require dental extractions and high-pull headgear to aid in bite closure [17-19] and intrusion of maxillary molars, respectively [21]. Complicating matters is the adherence to Angle's arbitrary diagnostic classifications of Class I, II and III which compels the clinician to change mandibular position and functional occlusion in order to achieve a morphologic occlusion that conforms to the arbitrary ideal of Class I [22-23]. In 2014, Viazis et al. [19] introduced biologically based orthodontic diagnostic terms after a multi year observational study of completed cases with an overwhelming majority treated non-extraction. Orthodontosis is defined as the non-inflammatory deficiency of alveolar bone in the horizontal dimension caused by the displaced root(s) of the tooth, typically palatally or lingually. Orthodontitis is defined as associated excess soft tissue manifestation and chronic manifestation. In effect the hard tissue bony hypoplasia (Orthodontosis) and soft tissue manifestation (Orthodontitis) associated with malpositioned roots represent unfinished eruption. The utilization of the orthodontic system, Fastbraces® is designed to decrease orthodontic forces by increasing wire flexibility and simultaneously moving the roots towards their final position from the beginning of treatment by allowing immediate torque from the onset [19]. This new technology of orthodontic tooth movement contemplates that light forces possibility stimulate bone remodeling around displaced roots therefore eliminating the need for extraction therapy.

Conclusion

Tongue thrust swallowing as a cause of an anterior open bite appears more a fallacy. The authors believe that an anterior open bite represents unfinished tooth eruption rather than a consequence of tongue thrust swallowing. This case report illustrates the potential of non-extraction orthodontic therapy with a system of braces that utilizes light forces thereby facilitating the continuation of eruption while inducing alveolar bone remodeling and development in shorter treatment times.

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Citation: Viazis AD, Viazis E, Pagonis TC (2016) The Fallacy of Tongue Thrust and Non-Surgical Treatment of a Severe Anterior Open Bite. J Dent Health Oral Disord Ther 4(4): 00120. DOI: 10.15406/jdhodt.2016.04.00120

Non-Surgical Orthodontic Treatment of an Orthognathic Surgical Case

Abstract

Introduction: Diagnosis and treatment planning for a skeletal malocclusion that exhibits maxillary retrusion in relation to a prognathic mandible is complex and involves quantification of the skeletal discrepancy while considering the limitations of conventional orthodontic systems. This case report illustrates a highly successful non-surgical orthodontic treatment of an orthognathic surgical case.

Case report: The patient, who is a 32 year old female with a maxillary crossbite and negative overjet, successfully completes non-surgical, non-extraction orthodontic treatment in a little over 12 months. Post-treatment results show a dramatic esthetic improvement, the elimination of a negative overjet and a stable occlusion with good intercuspation.

Conclusion: This case report demonstrates the potential of non-surgical, non-extraction orthodontic therapy for an orthognathic surgical case with a system of braces that utilizes light forces and immediately moves the tooth root (s) to their final position with alveolar bone remodeling and short treatment time.

Keywords: Orthognathic Surgery; Non-Extraction Orthodontic Treatment; Mandibular Prognathism

Case Report

Volume 4 Issue 5 - 2016

Anthony D Viazis[1], Evangelos Viazis[2] and Tom C Pagonis[3]*

[1] *Orthodontist, Private Practice, Dallas, Texas, USA*
[2] *Private Practice, Athens, Greece*
[3] *Assistant Clinical Professor, Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, Boston, MA, USA.*

***Corresponding author:** Tom C Pagonis, Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, MA 02115, USA, Tel: + 1 617-432-5846; Fax: + 1617-432-0901; Email: tom_pagonis@hsdm.harvard.edu

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Introduction

Treatment planning decisions that involve surgical intervention to realign the maxilla and mandible or to reposition dentoalveolar segments in cases of severe malocclusion associated with maxillary retrusion or deficiency and mandibular prognathism are based on the degree of discrepancy and performance limits of conventional orthodontic systems [1]. Clinical presentation of these skeletal and dental asymmetries are considered some of the most complex and difficult to treat and are often most classified as Angle's Class III [2]. Newer and biologically based diagnostic terminology for this condition is mandibular orthodontosis [3]. Patients typically exhibit a prominent lower third of the face which is accompanied by a concave facial profile with a lower lip that is protrusive relative to the upper lip [4]. While the contribution of oral function and environmental factors are not completely understood, this condition does exhibit a genetic predisposition tendency [5-7]. Proper diagnosis of the skeletal case is challenging and requires careful treatment planning. While the patient's chief complaint is most often associated with a poor facial appearance it may be accompanied by functional and temporomandibular problems [8].

The performance of conventional orthodontic bracket systems limits the clinician's treatment planning choices particularly for cases which typically border surgical intervention. Advances in mechanotherapy and diagnosis now allow the clinician to treatment plan certain skeletal cases with non-extraction orthodontic treatment without surgical intervention [9]. The following case report illustrates the successful outcome of non-surgical, non-extraction orthodontic treatment of an orthognathic surgical case.

Case Report

Diagnosis

The patient is a 32 year-old female who presented to the second author's private practice in Athens, Greece with a chief complaint of great disappointment with her smile and with difficulty chewing (Figure 1). She is apprehensive and admits to dental neglect as a consequence of her facial appearance. On examination the patient has a leptoproscopic facial form, a concave profile with an overbite of 3mm and a reverse overjet of 3 mm. The maxillary dentition with the exception of the maxillary left canine is in crossbite and the patient exhibits defective, discolored restorations. In addition, the maxillary right second premolar, the mandibular left second premolar and first molar are missing with periodontal attachment loss of the mandibular left first premolar.

Treatment objectives

Upon clinical examination and review of pretreatment panoramic and lateral cephalogram radiographs the patient was informed of both orthodontic and combined orthodontic/orthognathic surgical treatment options and advised of the potentially favorable prognosis of a new non-surgical orthodontic treatment. She decided to pursue non-surgical, non-extraction orthodontic treatment in order to correct her extensive crossbite, obtain proper overjet and overbite relations, level and align her occlusion and restore satisfactory esthetics by utilizing the bracket technology system of Fastbraces ® (Figure 2). Periodontal therapy was to be initiated prior to orthodontic treatment with replacement of defective restorations and composite veneers in esthetic areas immediately following orthodontic treatment.

Long term treatment goals include prosthetic restoration of the maxillary right and mandibular left quadrants.

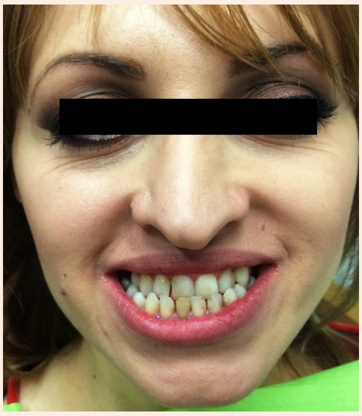

Figure 1A: Pre-treatment facial photograph

Figure 1B: Pre-treatment intra-oral photograhs

Treatment progress

Treatment took a little over 12 months with appointments scheduled approximately on a monthly basis. Brackets were initially placed on the four maxillary incisors for patient comfort for one month. At the second appointment, brackets were placed on all remaining maxillary teeth and at the third appointment brackets were placed on the mandibular teeth. Interproximal reduction of mandibular teeth in proximal contact was performed and some of the mandibular edentulous spaces were reduced with elastic powers chains.

Treatment results

Clinical results along with photographs and radiographs comparing pre and post-treatment show dramatic esthetic improvement, non-surgical orthodontic correction of the overbite and a stable occlusion. Edentulous spaces were reduced in preparation for future prosthetic restorations. Overjet and overbite was measured at between 1 to 2 mm with a treatment time of a little over 12 months (Figure 3 & 4).

Figure 2: Pre-treatment lateral cephalogram and panoramic radiographs.

Figure 3A: Post-treatment facial photograph

Figure 3B: Post-treatment intra-oral photographs.

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Figure 4: Post-treatment lateral cephalogram and panoramic radiographs.

At a one year follow-up visit the patient maintained stable occlusion with unchanged overjet/overbite relations (Figures 5 and 6).

Figure 5A: One year post-treatment facial photograph.

Figure 5B: One year post-treatment intra-oral photographs.

Figure 6: Comparison of pre-treatment, immediate post-treatment and one-year follow-up frontal view photographs

Discussion

The ultimate goal in treating skeletal malocclusions is to create dentoalveolar changes that correct this imbalance. The strategy for selecting orthodontic treatment or combined orthodontic treatment with surgical orthognathic surgery is usually based on the extent of the anteroposterior and vertical skeletal discrepancy [10] along with the limitations of conventional orthodontic bracket systems. Patients that exhibit significant skeletal discrepancies are often treated with maxillary, mandibular or bimaxillary orthognathic surgical intervention [11]. While mandibular orthognathic surgery (i.e. setback surgery) for true or pronounced mandibular prognathism is the treatment of choice, there is still conflicting evidence of its long term stability [12] with reports of up to 33% of cases exhibiting a clinically significant relapse of 2 mm or more [13,14]. Treatment planning is especially challenging with the borderline orthodontic / orthognathic surgery cases. Patients who forgo the risks and possible complications of surgical intervention for orthodontic treatment with traditional bracket systems frequently undergo multiple dental extractions with a treatment outcome that can be best described as esthetic camouflage since it only partially compensates for a skeletal imbalance [15].

The American Association of Oral and Maxillofacial Surgeons Criteria for Orthognathic Surgery considers a horizontal overjet of 0 to a negative value as medically appropriate for orthognathic surgery [16]. Yet this case report illustrates the dramatic non-surgical correction of maxillary crossbite with a 3 mm negative overjet with the Fastbraces ® system. It also illustrates the utilization of this system as a valuable adjunct to the comprehensive dental treatment plan of a complex adult case.

Conclusion

This case report demonstrates the successful non-extraction, non-surgical outcome and correction of a maxillary crossbite accompanied by a negative overjet with Fastbraces ®, a new technology system of braces that utilizes light forces and facilitates the continuation of eruption while inducing alveolar bone remodeling and development in short treatment times [3]. Carefully diagnosed skeletal malocclusions that are considered borderline orthodontic or orthodontic/orthognathic surgery can potentially be treated orthodontically without extractions and without orthognathic surgery in a timely manner.

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Non-surgical Orthodontic Adult Molar Crossbite Correction and Sleep Apnea

Abstract

Introduction: Diagnosis and treatment planning for a bilateral molar crossbite of an adult patient involves understanding its etiology, quantifying the discrepancy while considering the potential for surgical maxillary expansion due to the limitations of conventional orthodontic systems. This case report illustrates a highly successfully and novel non-surgical, non-extraction approach to correction of an adult bilateral molar crossbite with new orthodontics mechanics. It also provides the adjunctive effect of alleviating a constricted upper airway potentially benefitting patients with sleep apnea.

Case report: The patient, who is a 24-year-old female with a bilateral molar crossbite and transverse discrepancy of 3mm associated with an anterior open bite, successfully completes treatment with a maxillary expansion appliance immediately followed by non-surgical, non-extraction orthodontic treatment in a little over 12 months. Post treatment clinical and radiographic results show dramatic esthetic and functional improvement with the elimination of a bilateral molar crossbite and the establishment of a stable occlusion with good intercuspation. In addition, the post treatment cephalogram shows radiographic evidence of an increased upper airway dimension.

Conclusion: This case report demonstrates the potential of using a maxillary expansion appliance with non-surgical, non-extraction orthodontic therapy for an adult bilateral molar crossbite followed by the use of a system of braces that immediately moves the tooth root(s) to their final position with alveolar bone remodeling and short treatment time. In addition, it illustrates the possible adjunctive benefit of increasing the patient's airway which could provide relief for the sleep apnea patient.

Keywords: Crossbite; Maxillary expansion appliance; Orthodontics; Sleep apnea

Case Report

Volume 5 Issue 5 - 2016

Anthony D Viazis[1], Evangelos Viazis[2] and Tom C Pagonis[3]*

[1] *Orthodontist, Private Practice, Dallas, Texas, U.S.A*
[2] *Private Practice, Athens, Greece*
[3] *Assistant Clinical Professor (former), Harvard School of Dental Medicine, Boston, MA, U.S.A*

***Corresponding author:** Tom C Pagonis, Assistant Clinical Professor (former), Harvard School of Dental Medicine, Boston, MA, U.S.A, Telephone: + 1 617-432-5846; Fax: + 1617-432-0901; Email: dental.research@comcast.net

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Introduction

The clinical manifestation of a molar crossbite and its correction is complex requiring proper diagnosis and the development of an appropriate treatment plan. A posterior crossbite is defined as any abnormal buccal-lingual relation of opposing posterior teeth creating inadequate transversal relations such that buccal cusps of posterior maxillary teeth occlude with the central fossae of opposing mandibular teeth [1]. In effect, when compared to normal, the buccal-lingual relationships are reversed in a posterior crossbite. The incidence of this malocclusion varies among the Hispanic, African American and Caucasian populations at 7.3%, 9.6% and 9.1%, respectively [2,3]. The etiology of this malocclusion is typically multifactorial and can include a combination of dental, skeletal and functional components [4]. Specific disease entities which can contribute to this clinical presentation include Treacher Collins, Marfan Syndrome, Kippel-Fell Syndrome, Duchenne Muscular Dystrophy in addition to craniosynostosis associated with Crouzon's and Apert's Disease. Functional habits such as thumb sucking and sleep apnea are also responsible for constricted maxillary arches [4,5]. Of particular interest for a sleep apnea patient with a clinical presentation of a narrow maxilla and associated bilateral molar crossbite is the possible adjunctive alleviation of a constricted airway after maxillary expansion and orthodontic treatment. Since a bilateral posterior crossbite does not exhibit spontaneous correction, rapid maxillary expansion, also known as palatal expansion, should be attempted at the start of orthodontic treatment particularly for a patient 18 years old or younger [6,7]. Adult patients seeking treatment could be subjected to surgical correction of their crossbite. This case report illustrates the utilization of a maxillary expansion appliance in an adult patient non-surgically with advances in mechanotherapy and diagnosis which now allow the clinician to treatment plan certain skeletal cases with non-extraction, non-surgical orthodontic treatment in short treatment times [8,9]. It also illustrates the possible adjunctive benefit of relieving a patient's constricted airway which could provide relief for the sleep apnea patient.

Case Report

Diagnosis

The patient is a 24-year-old female who presented to the second author's private practice in Athens, Greece with a chief complaint of esthetic concerns with her smile and with difficulty chewing (Figure 1). On examination the patient has a mesoproscopic facial form, with an open bite of 5 mm, measured from maxillary and mandibular incisal edges and an overjet of 4mm. The maxillary arch is relatively narrow when compared to the mandible with a molar transverse discrepancy of 3mm. Functionally, the patient only occludes on her second premolars and molars while in maximum intercuspation. Although this patient did not exhibit sleep apnea symptoms, it is often associated with patients having a similar clinical presentation which may develop because of a constricted airway [4,5]. Examination of the oral soft tissue, periodontium and dentition revealed slight marginal edema.

Figure 1A: Pre-treatment facial and intra-oral frontal view photographs.

Figure 1B: Pre-treatment intra-oral occlusal view photographs.

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Treatment objectives

Upon completion of clinical examination and review of pretreatment panoramic and lateral cephalogram radiographs the patient was treatment planned with a two phase approach which included a maxillary expansion appliance (phase 1) followed by orthodontic treatment (phase 2) and advised of the potentially favorable prognosis of a new non-extraction orthodontic treatment. She decided to pursue attempted maxillary expansion followed by non-surgical, non-extraction orthodontic treatment in order to correct her bilateral molar crossbite, obtain proper overjet and overbite relations, level and align her occlusion and restore satisfactory esthetics by utilizing the bracket technology system of Fastbraces ® (Figure 2).

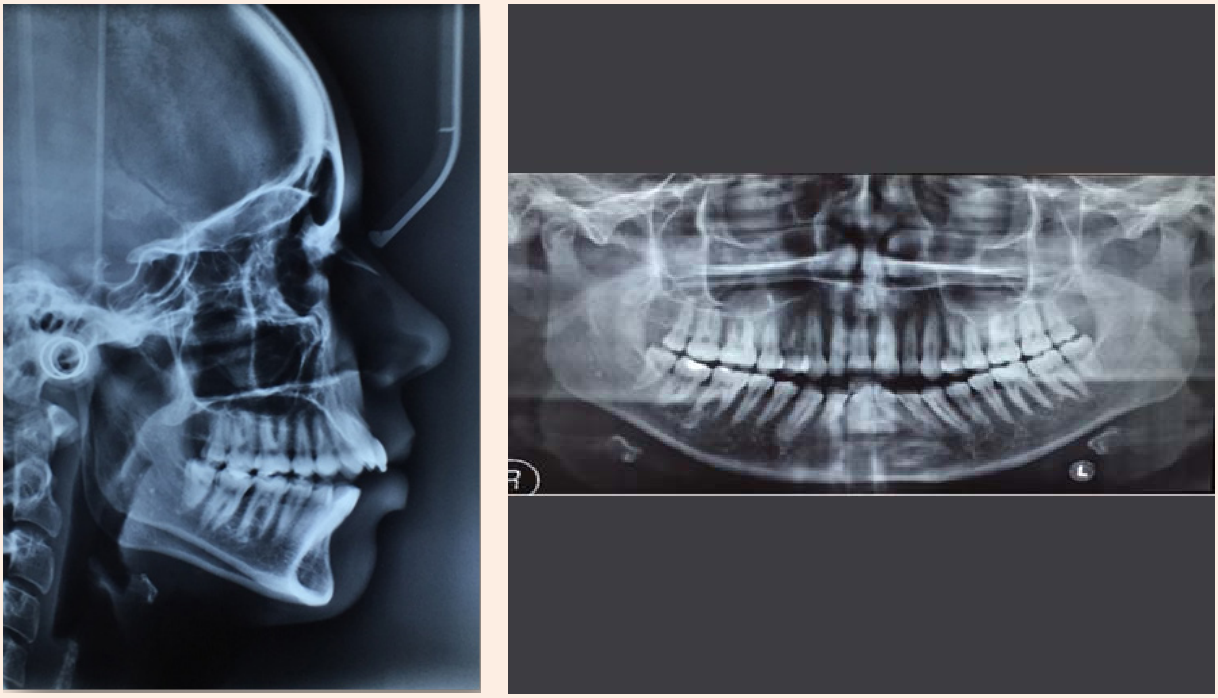

Figure 2: Pre-treatment lateral cephalogram and panoramic radiographs.

Treatment progress

At the initial treatment appointment, the patient was fitted with a Hyrax maxillary expansion appliance and was seen on a monthly basis. She wore her expander for a total of four months with one adjustment that took place at the two-month appointment. Also at two months, brackets were placed on the mandibular anterior teeth with subsequent application of brackets on remaining mandibular teeth and all maxillary teeth after the completion of phase 1 or maxillary expansion appliance treatment. Upon completion of orthodontic treatment and removal of all braces, a bonded maxillary fixed retainer was placed lingually from canine to canine. Total treatment time including the use of a maxillary expansion appliance took a little over 12 months with appointments scheduled approximately on a monthly basis with no interproximal reduction of mandibular teeth in proximal contact.

Treatment results

Clinical results along with photographs and radiographs comparing pre and post treatment show dramatic esthetic and functional improvement, elimination of the bilateral posterior crossbite and correction of anterior guidance with a stable occlusion. Overjet and overbite was measured at between 1 to 2 mm with a treatment time of a little over 12 months (Figure 3 & 4). In addition, comparing pre with post treatment cephalograms shows radiographic evidence of an increased upper airway dimension.

Discussion

The ultimate goal in treating skeletal malocclusions associated with both bilateral posterior crossbites with an associated anterior open bite is to create dentoalveolar changes that correct this imbalance. The strategy for selecting a two phased approach for treatment of a bilateral posterior crossbite which includes both the utilization of a maxillary expansion appliance followed by orthodontic treatment is limited by

a. The age of the patient as it relates to the potential of maxillary expansion due to ossification of the midpalatal suture.

b. The limitations of conventional orthodontic treatment. The literature continues to suggest that when untreated, crossbites can lead to long term and permanent growth alteration thereby necessitating early treatment intervention [10].

Citation: Viazis AD, Viazis E, Pagonis TC (2016) Non-surgical Orthodontic Adult Molar Crossbite Correction and Sleep Apnea. J Dent Health Oral Disord Ther 5(5): 00168. DOI: 10.15406/jdhodt.2016.05.00168

Figure 3A: Post-treatment facial and intra-oral frontal view photographs.

Figure 3B: Post-treatment intra-oral occlusal view photographs.

Yet little evidence exists on using a similar treatment protocol for an adult patient. This case report demonstrates the potential of utilizing a maxillary expansion appliance for a 24-year-old adult patient for the first phase of treatment to correct gross bilateral molar crossbite by initially tipping maxillary posterior teeth buccally rather than expanding the maxilla at the midpalatal suture thereby markedly reducing the transverse discrepancy. Non-surgical adult expansion can now be done on cases of end on to slightly lingual (i.e. 1 to 3 mm) bilateral posterior molar crossbite. Severe cases (i.e. 3 mm or more of maxillary molar lingual crossbite) especially when the maxillary molar is one half way or more lingual to the mandibular molar may require maxillary jaw surgery. The maxillary expander is turned every other day (.25 mm or one turn) and is removed when the maxillary molar occlusal surface is half way buccal to the mandibular molar surface but not in complete buccal crossbite. The same day the maxillary expander is removed, full maxillary braces and the wire are placed and the elastics are initiated on a full time basis. The mandibular braces would have been placed at a prior patient visit. The torque applied by the Fastbraces ® technologies square wire bracket systems immediately begins up righting the roots of the tipped molars into their final upright position. This would not be possible with old style braces that use a round wire which by definition applies no torque. The subsequent application of the orthodontic system Fastbraces ®, a new technology system of braces that utilizes the application of torque which facilitates root up righting and thus alveolar bone remodeling and development thereby correcting transverse discrepancies while, in this particular case, also correcting an associated anterior open bite in short treatment times. There is a growing body of literature and accompanying interest in upper airway shape and dimensions primarily due to the relationship between upper airway configuration and sleep-disordered breathing including obstructive sleep apnea [11, 12]. Although several modalities such as computed tomography scanning and magnetic resonance imaging are available, the lateral cephalogram remains an important, readily available and less expensive radiographic screening tool for obstructive sleep apnea [13]. Analysis and upper airway measurement of landmarks on cephalograms which compare sleep apnea and healthy patients show a clear tendency for sleep apnea patients to have smaller airway dimensions [14,15]. Although this patient did not demonstrate or present with symptoms of sleep apnea, comparative pre and post treatment cephalograms suggest a larger upper airway opening at the approximate areas between the dorsum of the tongue and posterior pharyngeal wall. While additional clinical research is necessary this treatment presents a possible adjunctive benefit to the sleep apnea patient with a constricted upper airway. This case illustrates the dramatic non-surgical correction of a bilateral molar crossbite with the Fastbraces ® system with possible additional benefits of improving upper airway dimensions. It remains a valuable adjunctive system to comprehensive dental treatment planning of a complex adult case.

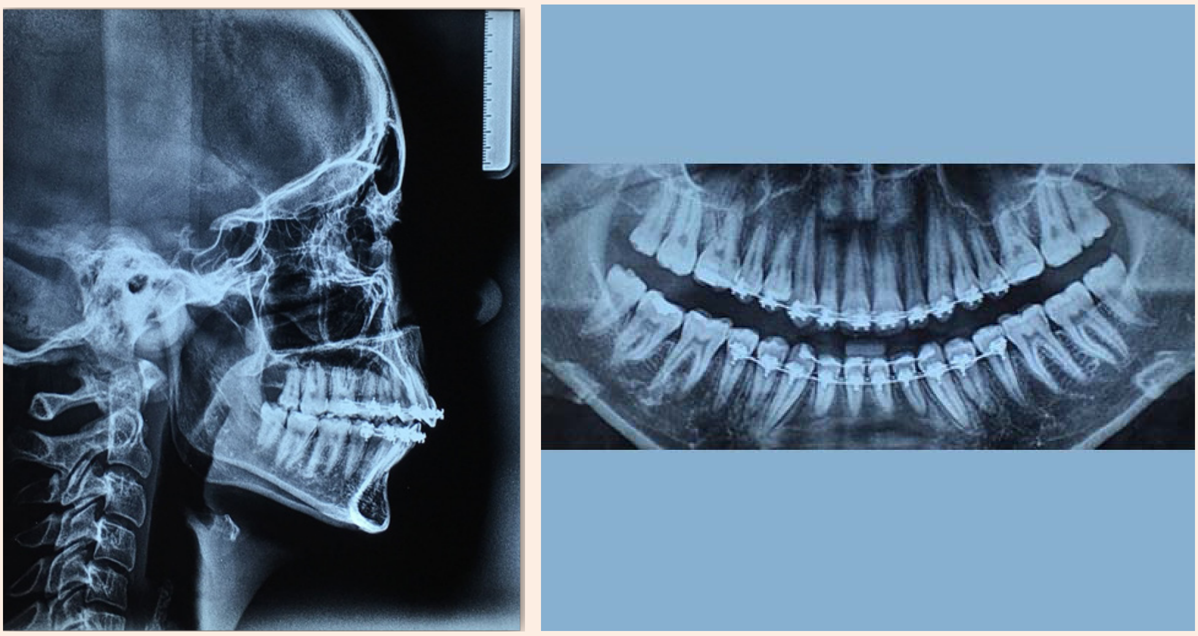

Figure 4: Post-treatment lateral cephalogram and panoramic radiographs.

Conclusion

This case report demonstrates the successful non-extraction, non-surgical outcome and correction of an adult bilateral molar crossbite accompanied by an anterior open bite with Fastbraces ®, a new technology system of braces that facilitates the continuation of eruption while inducing alveolar bone remodeling and development in short treatment times [16]. This treatment offers consideration as a possible adjunct to patients also presenting with sleep apnea by improving upper airway dimensions. Carefully diagnosed skeletal malocclusions of this magnitude for an adult patient that are typically treatment planned for maxillary jaw surgery can potentially be treated orthodontically without extractions in a timely manner.

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Alveolar Bone Growth with Orthoeruption

Abstract

This teenage patient presents with pronounced esthetic and functional dental concerns. An anterior frontal view of the patient's dentition shows virtually total facial blockage of the maxillary right central incisor creating mesial contact of the right lateral incisor with the left central incisor immediately lingual to the blocked out right central incisor. A similar severe misalignment takes place with the orientation of the mandibular left canine and adjacent mandibular left premolar and mandibular left lateral incisor. In addition, the patient exhibits a pronounced overbite with maxillary anterior teeth entirely covering the opposing mandibular teeth and with an overjet of 4 mm. This case report illustrates the potential to grow alveolar bone with the orthodontic systems known as Fastbraces® Technologies that is based on the non-extraction mechanically aided continuation of eruption by moving the roots towards their final position from the onset of therapy. Post treatment clinical photos and radiographic results show dramatic esthetic and functional improvement with the elimination of the severe pretreatment crowding and occlusal discrepancy with the establishment of a stable occlusion and good intercuspation.

Keywords: Severe crowding; Orthoeruption; Orthodontics; Braces; Alveolar bone growth

Clinical Paper

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Anthony D Viazis[1], Evangelos Viazis[2] and Tom C Pagonis[3]*

[1]Orthodontist, Private Practice, Dallas, Texas, U.S.A
[2]Private Practice, Athens, Greece
[3]Assistant Clinical Professor (former), Harvard School of Dental Medicine, Boston, MA, U.S.A

***Corresponding author:** Tom C Pagonis, Assistant Clinical Professor (Former), Harvard School of Dental Medicine, Boston, Massachusetts, USA, Email: dental.research@comcast.net

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Introduction

While classifying the degree of severe anterior crowding is subjective, the dichotomy of orthodontic treatment planning with or without extractions dates back to the 1890's when Angle, who introduced classifications of malocclusions, initially advocated non-extraction orthodontic therapy [1]. Subsequently, Calvin Case challenged Angle's assertion that the presence of all teeth was necessary to produce balance and harmony and argued that mechanical forces could not induce basal bone growth beyond the developed or inherent size [2]. In 1944, Angle's student, Charles Tweed noted a high prevalence of relapse in his cases and abandoned his mentor's teachings of non-extraction therapy [3]. The dichotomy of extraction vs non-extraction in orthodontic treatment planning remains today even when considering diagnostic elements such as molar relationship, tooth-arch discrepancy or cephalometric discrepancy and facial profile. This case report illustrates the potential to grow alveolar bone with the orthodontic systems known as Fastbraces® Technologies that is based on the non-extraction mechanically aided continuation of eruption by moving the roots towards their final position from the onset of therapy.

Case Report

Diagnosis

This young teenage patient presented to the second author's private practice in Athens, Greece with a chief complaint of esthetic concerns and with difficulty chewing (Figure 1). On examination the patient has a mesoproscopic facial form with an overbite of 5 mm and an overjet of 4mm. Of note, the patient's maxillary anterior dentition shows virtually total facial blockage of the maxillary right central incisor creating mesial contact of the right lateral incisor with the left central incisor immediately lingual to the blocked out right central incisor. The mandibular arch also exhibits severe crowding in the area of the mandibular left canine.

Treatment objectives

Upon completion of the clinical examination and review of the pre-treatment panoramic and lateral cephalogram radiographs (Figure 2), a non-extraction treatment regimen was recommended due to the favorable prognosis of alveolar bone growth with a new form of orthodontic tooth movement that involves the immediate activation of the roots toward their final naturally erupted positions. This treatment was recommended in order to correct the severe crowding, obtain proper overjet and overbite relations, level and align the occlusion and restore satisfactory esthetics by utilizing the bracket systems of Fastbraces® Technologies.

Treatment progress

At the initial treatment appointment, four brackets were placed on the maxillary anterior teeth for patient comfort and the patient was followed every 21 days for a period of four months (Figure 3). This initial set up along with the subsequent addition of full maxillary and mandibular brackets (Figure 4) utilizing the orthodontic systems of Fastbraces® Technologies is designed to provide appropriate force by inducing alveolar bone growth to not only accommodate the severely misaligned maxillary right central incisor but accommodate all teeth in their respective arches. Total treatment time with full orthodontic brackets took a little over 12 months with appointments scheduled approximately on a monthly basis with minor interproximal reduction mesial to all canine teeth.

Figure 1A: Pre-treatment intra-oral frontal view photographs.

Figure 1B: Pre-treatment intra-oral occlusal view photographs.

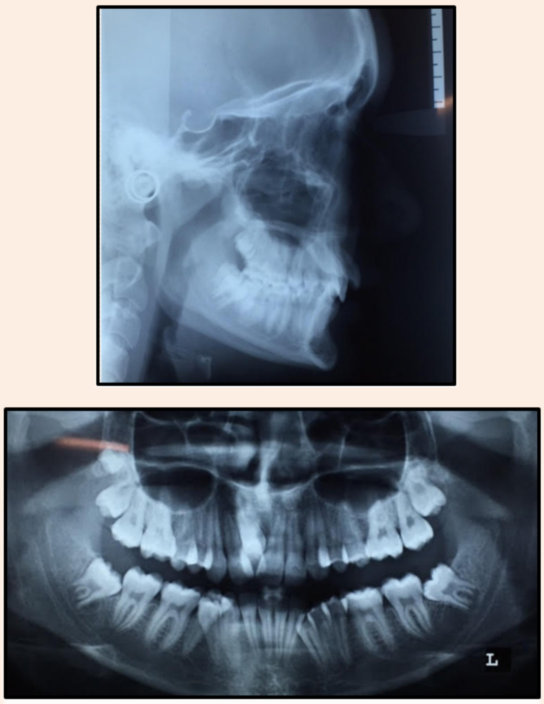

Figure 2: Pre-treatment lateral cephalogram and panoramic radiographs.

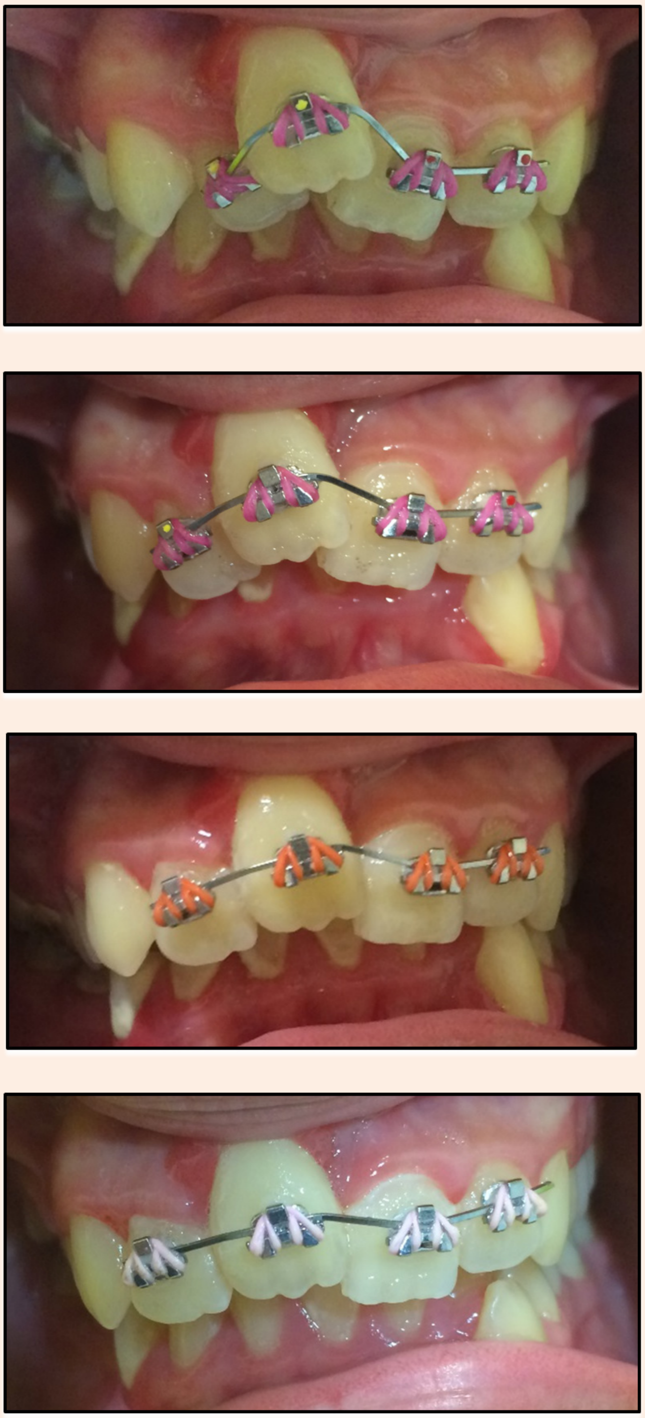

Figure 3: Treatment progress with four maxillary anterior brackets.

Figure 4: Treatment progress with full maxillary and mandibular brackets.

Treatment results

Clinical results along with post treatment radiograph (Figure 5) and photographs (Figure 6) show dramatic esthetic improvement, particularly with alveolar bone development which allowed the alignment of the right maxillary central incisor into its natural position. Post treatment results also show a stable occlusion with proper over jet and over bite relations.

Figure 5: Post treatment lateral cephalogram and panoramic radiographs.

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Figure 6: Post treatment facial and intra-oral frontal view photographs

Figure 7a: Comparing Before and After frontal, right and left buccal photographs

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Figure 7b: Comparing Before and After maxillary and mandibular occlusal photographs

Discussion

In 2014, Viazis et al. [4] introduced the biologically based orthodontic diagnostic terms of Orthodontosis and Orthodontitis [4]. Orthodontosis is defined as the non-inflammatory deficiency of alveolar bone in the horizontal dimension caused by the displaced root(s) of the tooth, typically palatally or lingually. Orthodontitis is defined as associated excess soft tissue manifestation and chronic inflammation. In effect the hard tissue bony hypoplasia (Orthodontosis) and soft tissue manifestation (Orthodontitis) associated with malpositioned roots represent unfinished eruption. Based upon these definitions, orthodontic treatment should be directed towards mimicking and continuing the light forces of natural eruption possibly stimulating bone remodeling around displaced roots thereby eliminating the need for extraction therapy. Furthermore, this mechanically assisted continuation of eruption has been defined as “orthoeruption” in the literature [4] and allows for the up-righting of displaced roots into a straight position as if the teeth erupted in that position. Therefore, orthoeruption results in the alveolar bone remodeling and restoration of the dental arch to its appropriate natural size and shape. Accordingly, non-extraction therapy is almost always achieved through this alveolar bone growth as the alveolar bone reacts to a tooth erupting in its correct place in the arch.

The clinical pre-treatment presentation of this case especially with regard to the maxillary right central incisor clearly shows the lack and perhaps more accurately, the absence of alveolar bone on the proximal and facial sides. Even today and with this clinical presentation, the century plus old dichotomy of extraction vs non-extraction in orthodontic treatment would lead most orthodontic clinicians to extraction therapy based upon the out dated concept forwarded by Calvin Case which maintained that alveolar bone has little or no capacity to grow with traditional orthodontic mechanical forces. This case report along with other studies in the literature [5-8] illustrates the potential to grow alveolar bone with the orthodontic systems of Fastbraces® Technologies which is based on the non-extraction mechanically aided continuation of eruption by moving the roots toward their final position from the onset of therapy.

By definition natural eruption is root movement which is followed by alveolar bone growth. The new bone around the final position of the naturally erupted root demonstrates the alveolar bone growth that occurred during eruption. If not, the root would find itself outside the alveolar bone housing. So a defacto consequence of root movement in natural eruption is the alveolar bone growth around the new position. Much like the remodeling of alveolar bone to accommodate teeth during natural eruption, orthodontically induced eruption or orthoeruption may stimulate the continued remodeling of alveolar bone to accommodate the roots towards their final naturally erupted position.

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Conclusion

This case report demonstrates the successful non-extraction orthodontic correction, of severe maxillary anterior crowding or localized orthodontosis and shows the dramatic esthetic and functional improvement (Figure 7) with the establishment of a stable occlusion and good intercuspation with Fastbraces® Technologies. These new technology systems of braces facilitate the continuation of eruption while inducing alveolar bone remodeling and development in short treatment times by moving the tooth roots toward their final naturally erupted position from the beginning of treatment. This orthodontically induced eruption of teeth results in the successful completion of cases non-extraction.

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The Biology of Orthodontic Treatment Time; Days versus Years

Abstract

The accurate assessment of the treatment time of an orthodontic case and its actual duration are extremely important considerations for patient acceptance of treatment as well as the credibility of the health care provider and the financial health of the dental practice. There are multiple variables that can affect orthodontic treatment time ranging from diagnosis, to treatment protocols and patient compliance. While these variables have been widely studied there is a lack of innovation in orthodontic bracket design and its potential impact on decreasing orthodontic treatment times. Three orthodontic patients, seen by three different clinicians present to individual offices with a pre-treatment Angle classification of Class I, Class II and Class III respectively and are successfully treated in markedly reduced orthodontic treatment times with the new patented bracket system of FASTBRACES® Technologies known as FASTBRACES® TURBO™. The patented systems of FASTBRACES® Technologies facilitate the continuation of eruption while possibly inducing alveolar bone remodeling and development in short treatment times by moving the tooth roots toward their final naturally erupted position from the beginning of treatment. This orthodontically induced eruption of teeth results in the successful completion of cases non-extraction in markedly reduced treatment times.

Keywords: Orthoeruption; Orthodontics; Braces; Alveolar bone growth; Orthodontic treatment time

Case Report

Volume 8 Issue 1 - 2017

Anthony D Viazis[1], Evangelos Viazis[2] and Tom C Pagonis[3]*

[1]*Orthodontist, Private Practice, Dallas, Texas, USA*
[2]*Private Practice, Athens, Greece*
[3]*Assistant Clinical Professor (former), Harvard School of Dental Medicine, Boston, MA, USA*

***Corresponding author:** Tom C Pagonis, Assistant Clinical Professor (former), Harvard School of Dental Medicine, Boston, MA, USA, Email: dental.research@comcast.net

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Introduction

Invariably every potential orthodontic patient in the consultation or treatment planning phase is eager to know the proposed total duration of treatment. Motivation with compliance and commitment to treatment are important factors for the patient and the family along with associated financial implications. The clinician must be prepared to provide therapy that meets the specific lifestyle needs of patients, especially with an increasing segment of the adult population now seeking orthodontic care [1]. Treatment efficiency translates directly into practice financial health for the clinician because unanticipated prolonged treatment time erodes profitability. Cost efficiencies become even more important as the size of a practice grows and are an area of interest for a third party (insurance) provider [2]. A system that accurately predicts orthodontic treatment time is key to both the clinician and patient because it provides a vitally important tool in practice building [2] for the clinician and is directly related to greater overall patient satisfaction [3]. Furthermore, a system of braces that safely, predictably and effectively treats a broad cross section of clinical presentations non-extraction, while substantially reducing orthodontic treatment time presents an extremely desirable therapy for both clinician and patient.

While a review of the key factors and variables that affect orthodontic treatment time is important, this paper will also review a new biologically-based paradigm in orthodontic diagnosis [4] and a novel biologically based orthodontic treatment approach. In addition, the authors will provide three cases of Angle's orthodontic classifications of Class I, II and III, all treated with the patented systems of FASTBRACES® Technologies. This revolutionary design known as FASTBRACES® TURBO™ illustrates the potential to safely stimulate alveolar bone growth in even shorter treatment times based on the non-extraction mechanically and possibly organically induced continuation of eruption by moving the roots towards their final position from the onset of therapy. Orthodontic treatment times can now be classified in terms of days rather than years.

There is a substantial body of literature that has studied variables which could influence treatment times in both adolescents and adults. It has been suggested that the key distinguishing factors between adult and adolescent patients are lack of active growth, periodontal involvement and a higher occurrence of restorative interventions [5]. These traditional variables which can affect orthodontic treatment time can generally be grouped into diagnosis (including demographic observations), treatment, and degree of patient compliance.

Diagnostic variables

Among this group which excludes craniofacial abnormalities, generally accepted parameters include gender [5-9], age [10], pre-treatment molar relationship, general pre-treatment assessment of malocclusion [11] including overjet [12,13] and overbite [14,15] along with a variety of cephalometric features (i.e. SNA, SNB and ANB) (13, 15).

Treatment protocols

A generally accepted subset of this category includes extraction or non-extraction therapy [5-16], technique or operator skill and experience [9-17], the comparison of ceramic vs. metal brackets [6] along with issues of orthodontic appliance breakage [6,11].

Patient compliance

This category includes oral hygiene during active treatment [11-19], the number of missed appointments [11] and even compliance with use of intraoral elastics [11-20]. Taken together the majority of studies show conflicting results particularly when examining certain variables in the Diagnosis and Treatment categories. Specifically, there appears to be disagreement or lack of consensus on whether treatment time is affected when examining both pre-treatment malocclusion [5-8] and molar relationships [5-11]. Interestingly enough the majority of studies indicate that extraction therapy may increase treatment time when compared to non-extraction therapy [5-11]. Factors such as gender, the choice of ceramic vs metal brackets and facial pattern had no significant influence on orthodontic treatment time particularly for the adult. What seems to be consistent as it relates to affecting and lengthening treatment time is in the Patient Compliance category and includes the above referenced factors of oral hygiene, the number of missed appointments, compliance with use of intraoral elastics and incidence of broken appliances.

Report of Cases

Three adult patients, seen by three different providers presented for orthodontic treatment with Angle classifications of Class I, Class II and Class III respectively. Full maxillary and mandibular fixed appliances followed by retainers were applied for all three cases. Treatment time for the three patients presenting with Class I, Class II and Class III malocclusions took 96 days, 72 days and 117 days respectively (Figures1-3).

Figure 1: Before, during, and after frontal photographs of Angle Class I malocclusion treated in 96 days (*Courtesy of Dr. Patrick Assal, Lausanne, Switzerland*).

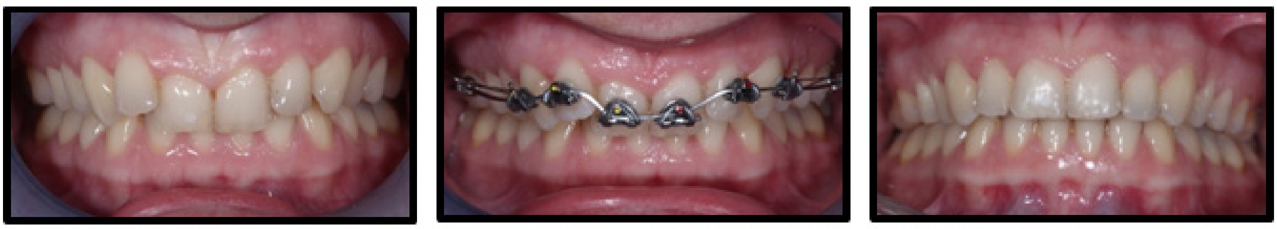

Figure 2: Before, during, and after frontal photographs of Angle class II malocclusion treated in 72 days (*Courtesy of Dr. Melissa Goddard, Liverpool, United Kingdom*).

Figure 3: Before, during, and after frontal photographs of Angle class III malocclusion treated in 117 days (*Courtesy of Dr. Stephan Van Vuuren, London, United Kingdom*).

Discussion

The extraordinary reductions of treatment times for Class I, II and III cases are clearly demonstrated in these three case reports. The question the clinicians should be asking is how orthodontic treatment times now can be addressed in terms of days when nearly all comprehensive orthodontic case treatment times are addressed in terms of years. While esthetic and functional concerns represent the key elements for patients seeking orthodontic treatment, the proposed treatment time in many cases represents the central cohesive element of a patient accepting a proposed orthodontic treatment plan. In addition, it is incumbent upon the clinician to assimilate possible individual patient variables that could potentially affect treatment time and present both the most accurate and if possible, the shortest orthodontic time with great attention to safety, patient comfort, and clinical efficacy. While a wide range of variables potentially affecting orthodontic treatment time are widely cited in the literature there is great controversy surrounding the scientific basis of outdated yet remarkably enduring diagnostic terminology - particularly Angle's classification which dates back to 1899 [21]. This is coupled with a substantial gap in knowledge and understanding of biologically based orthodontic diagnostic terms, the clinical recommendation of extraction therapy that is largely based upon outdated concepts which maintain that alveolar bone has little or no capacity to grow [22] and the lack of innovation in bracket design. Even with the introduction of flexible nickel-titanium orthodontic wires, clinicians have not evolved from a segmented approach to therapy that fundamentally contemplates the use of a rounds wire to move clinical crowns at the beginning of treatment which is followed by the addition of successive rectangular wires to move the roots of teeth. In aggregate, the combination of diagnostic terms that lack scientific validity, stagnation in bracket innovation and a seemingly unwavering adherence to the static nature of alveolar bone drives the clinician to extraction therapy or non-extraction from uncontrolled tipping of teeth with round wires. The use of outdated orthodontic mechanics clinically delivers excessive orthodontic mechanical forces with a staged multiple wire approach of moving crowns then roots through, rather than with alveolar bone. The cumulative effect is a greater duration of treatment with increased mechanical forces. Therefore, it is the opinion of the authors that these practices represent some of the most important reasons why orthodontic treatment times have not been decreased. It is ironic that many diagnostic, treatment and patient compliance variables have been studied without contemplating the impact of improving bracket design and biomechanics. One need not look further than the lighter force, the capacity to stimulate remodeling and growth of alveolar bone along with the associated treatment time of natural eruption in order to develop advanced orthodontic technology systems. These new patented systems of braces known as FASTBRACES® Technologies are designed to facilitate the continuation of eruption while inducing alveolar bone remodeling and development in short treatment times by moving the tooth roots toward their final naturally erupted position from the beginning of treatment. This orthodontically induced eruption of teeth results in the successful completion of cases non-extraction.

Viazis et al. [4] introduced the biologically based orthodontic diagnostic terms of Orthodontosis and Orthodontitis [4]. Orthodontosis is defined as the non-inflammatory deficiency of alveolar bone in the horizontal dimension caused by the displaced root(s) of the tooth, typically palatally or lingually. Orthodontitis is defined as associated excess soft tissue manifestation and chronic inflammation. In effect the hard tissue bony hypoplasia (Orthodontosis) and soft tissue manifestation (Orthodontitis) associated with malpositioned roots represent unfinished eruption. Based upon these definitions, orthodontic treatment should be directed towards mimicking and continuing the light forces of natural eruption possibly stimulating bone remodeling around displaced roots thereby eliminating the need for extraction therapy. Furthermore, this mechanically assisted continuation of eruption has been defined as Orthoeruption in the literature [4] and allows for the up-righting of displaced roots into a straight position as if the teeth erupted in that position. Therefore, Orthoeruption results in the alveolar bone remodeling and restoration of the dental arch to its appropriate natural size and shape. Accordingly, non-extraction therapy is almost always achieved through this alveolar bone growth as the alveolar bone reacts to a tooth erupting in its correct place in the arch.

The three cases presented in this paper along with other published literature [23-37] illustrate the potential to stimulate remodeling and growth of alveolar bone with the patented orthodontic systems of FASTBRACES® Technologies almost irrespective of the type of pre-treatment dental malocclusion. The authors believe these new technology systems of braces including the newly introduced FASTBRACES® TURBO™ facilitate the continuation of eruption while inducing alveolar bone remodeling and development in short treatment times by moving the tooth roots toward their final naturally erupted position from the beginning of treatment design. Theoretically and when compared to natural continuous eruption, the technology sustains Orthoeruption which induces alveolar bone formation thereby providing space. This self-generating process of alveolar bone could closely mimic natural eruption by organically induced alveolar bone growth and remodeling. This orthodontically induced eruption of teeth results in the successful completion of cases non-extraction.

Our theory requires additional study both at the clinical and biological level. For example, while the authors believe that Orthoeruption is said to be similar to or the continuation of natural eruption we realize that natural eruption takes place with a developing root and an incompletely formed periodontal ligament while Orthoeruption takes place with a fully formed root and periodontal ligament. Why then are there reduced treatment times with the patented systems of FASTBRACES® Technologies and how can a fully formed root continue to erupt or exhibit Orthoeruption with reduced treatment times which approximates the time frame of natural continuous eruption? All cases presented herein finished within 120 days which is typically the time frame of the continuous eruption of teeth or from the moment the clinical crown appears in the oral cavity until it reaches occlusal contact with the dentition of the opposing arch. It thus begs the question that Orthoeruption by continuing the motion of the tooth by utilizing the light forces of the patented systems of FASTBRACES® Technologies happens within the normal biological boundaries of the human body. Further speculation may lead the clinician to surmise that the patient "feel" of normality similar to that of natural eruption (with the exception of an exfoliating deciduous tooth for example) represents the ideal force that fools the body by continuing the eruption during treatment.

One area to explore is hyalinization of the periodontal ligament (PDL) during orthodontic tooth movement. Hyalinization fundamentally represents the localized degenerative change in the ultrastructure of the periodontal ligament brought on by pressure during orthodontic tooth movement. This is based on the well-established pressure/tension theory of orthodontic tooth movement which even recent literature suggests that as a theory it is not completely understood [28]. Specifically, this localized cell death or hyalinization on the pressure side of orthodontic tooth movement against the periodontal ligament is an undesirable effect characterized by disturbances in blood flow and changes in the PDL collagenous matrix caused by the tipping forces of round wires that concentrate around the cemeto-enamel-junction and the root apex. In the presence of hyalinization, orthodontic tooth movement cannot occur until the hyalinized tissue is resorbed and replaced by healthy tissue again. This then allows the underlining resorption of adjacent alveolar bone which represents tooth movement. The hallmark clinical presentation of hyalinization is periodontal pain which is caused by the combination of inflammation, edema, pressure and ischemia. Pain typically starts within 4 hours of traditional orthodontic activation increasing over the next 24 hours. Inflammation on the other hand subsides in about six weeks and tissues are restored accordingly. Therefore, traditional orthodontic treatment initiates excessive and unevenly distributed mechanical forces which then creates hyalinization of the PDL thereby stopping active tooth movement while generating patient pain [29]. The limiting factor in decreasing orthodontic treatment time appears to be hyalinization induced by the clinician. The PDL may be restored but the root apex is permanently resorbed – accepting it as a consequence of traditional orthodontic tooth movement. This unfavorable sequence of biological events causes a significant treatment time gap until tissues are restored from hyalinization only to have them damaged again with a subsequent orthodontic treatment visit. This creates a cycle of inefficient and prolonged treatment, patient discomfort and possible root resorption.

As shown in other published literature [23-29], orthodontic therapy with the patented systems of FASTBRACES® Technologies can safely, effectively and efficiently complete treatment non-extraction with little patient discomfort, and with little to no apical resorption all among a diverse set of clinical presentations. Therefore, the orthodontic or tooth movement process, the lack of root damage, the lack of patient pain and a completion time of 120 days approximates natural eruption. This lack of patient pain coupled with a duration of treatment equivalent to natural continuous eruption and a natural looking mouth upon treatment completion strongly suggests a new paradigm of orthodontic tooth movement that is biologically based and similar to natural continuous eruption. Furthermore, the absence of pain in both natural eruption and Orthoeruption strongly suggests little to no inflammation or little to no hyalinization. The authors believe that shortened treatment times with the patented systems of FASTBRACES® Technologies are strongly correlated with semi-hyalinization to no hyalinization. Additional research is needed to study possible shortened times of hyalinization or even unremarkable changes towards hyalinization with the lighter forces of the patented systems of FASTBRACES® Technologies as a possible reason for markedly decreased orthodontic treatment time. Another area of research that may provide additional clues of the underlining biology of decreasing orthodontic treatment times would be to compare the complex interactions and cascade of reactions between alveolar bone remodeling associated with orthodontic tooth movement and the biology of fracture healing whether alveolar or other. This might suggest a way to minimize the impact of our orthodontic interventions so as to facilitate and promote alveolar bone remodeling and growth thereby decreasing orthodontic treatment time.

Conclusion

The three case reports covered in this paper illustrate the potential to stimulate remodeling and growth of alveolar bone with shortened treatment times by utilizing the patented orthodontic systems of FASTBRACES® Technologies which is based on the non-extraction mechanically aided continuation of eruption by moving the roots toward their final position from the onset of therapy. The shortened orthodontic treatment times are consistent across a diverse cross section of pre-treatment malocclusions with treatment performed by three different clinicians.

The authors suggest that among variables used to access duration of orthodontic treatment there is a considerable gap of knowledge in biologically based orthodontic diagnosis, associated treatment planning and most importantly, a lack of innovation in bracket design. The introduction of the patented systems of FASTBRACES® Technologies including the newly introduced FASTBRACES® TURBO™ represent novel and innovative systems which facilitate what the authors believe to be the continuation of natural eruption or Orthoeruption inducing alveolar bone remodeling and development by moving the tooth roots toward their final naturally erupted position from the beginning of treatment. This orthodontically induced eruption of teeth results in the successful completion of cases non-extraction. Similarities between the processes of natural continuous eruption and Orthoeruption suggest a lack of inflammation and therefore a diminished degree of or absence of hyalinization as the possible key to reduced orthodontic treatment times with the patented systems of FASTBRACES® Technologies.

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Orthodontic Diagnosis Based upon Alveolar Bone Morphology

Abstract

The 120-year old classification developed by Edward Angle has largely been sustained to the present day as the main language of malocclusion. It serves as the basis for the orthodontic treatment goal of attaining a specific molar relation arbitrarily defined as "ideal" with an accompanying prescribed facial profile. This classification is not biologically based and was founded on social observation of Caucasians thereby not accounting for natural variations across ethnic groups and race. The authors believe it misdirects treatment and propose new biologically based diagnostic terms centered on the pretreatment clinical morphology of the alveolar bone. Logically, treatment is based on improving the alveolar bone morphology by maintaining a stable occlusion irrespective of molar class with a novel patented orthodontic system.

Keywords: Orthodontics; Alveolar bone morphology; Maxillary and mandibular hypoplasia; maxillary and mandibular hyperplasia; Orthoeruption; Orthodontosis; Orthodontitis; Fastbraces®

Clinical Paper

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Anthony D Viazis[1], Evangelos Viazis[2] and Tom C Pagonis[3]*

[1]*Orthodontist, Private Practice, Dallas, Texas, USA*
[2]*Private Practice, Athens, Greece*
[3]*Assistant Professor (former), Harvard School of Dental Medicine, Boston, MA, USA*

***Corresponding author:** Tom C Pagonis, Assistant Clinical Professor (Former), Harvard School of Dental Medicine, Boston, MA, USA, Email: dental.research@comcast.net

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Introduction

Growing scientific evidence which directly refutes the basis for conventional diagnostic classification of malocclusion along with dramatic improvements in the design of orthodontic brackets and implementation of new orthodontic techniques clearly justify the need for biologically driven orthodontic diagnoses. Angle's 120-year old classification of malocclusion [1] has remarkably endured and continues to be utilized as the main language of malocclusion among orthodontic specialists in spite of its lack of verifiable scientific validity [2-6]. In effect, an arbitrary or subjective concept of ideal occlusion based upon Angle's classification of malocclusion serves as the basis for orthodontic treatment planning for a large majority of orthodontic providers around the world. Yet there is no evidence to suggest that this arbitrary "ideal" occlusion provides significant health benefits or that it significantly improves oral function. Furthermore, Angle's classification is not based on a verifiable biologically based constant but relies on dental intercuspation or static occlusion which takes place between 15 to 30 minutes per day [7]. This only represents a static glimpse of a 24-hour cycle of dynamic occlusal function. Cusps of teeth do not possess an innate or pre-programmed function to articulate in a specific way or position. Furthermore, cusps do not know Angle's classifications and adapt to a functional occlusion with maximum intercuspation irrespective of the anterior-posterior position of the mesio-buccal cusp of the maxillary first molar relative to the mandibular first molar. Angle's classification of malocclusion can more appropriately be referred to as social observations rather than pathologic diseases. We therefore propose orthodontic diagnoses of malpositioned teeth based upon the pretreatment clinical morphology of the alveolar bone and accompanying orientation of tooth roots. The alveolar bone morphology is a biologically based constant and a logical element to utilize in the diagnostic process.

Materials and Methods

Etiology and prevalence of malocclusion

In 1771, John Hunter, a British anatomist was one of the first to explain normal occlusion and described the growth of jaws [8]. Addressing the complex nature of etiology requires an appreciation and even an agreement on developing criteria for a normal occlusion. Contemporary attempts to classify normal occlusion have been forwarded by Andrews [9], Roth [10], along with Ash & Ramjford [11]. Rinchuse et al. [12] introduced the functional concept of occlusion directly challenging "experience-based" rather than evidence-based concepts first proposed by Angle. Several classification methods have been proposed in an attempt to categorize the etiology of malocclusion. This includes Moyers' classification [13] which identifies heredity, trauma, physical agents, habits, diseases, malnutrition and developmental defects of unknown origin. In addition, Graber's classification [14] divided etiologic factors into two groups namely general factors and local factors. General factors include heredity, congenital defects, and environment, predisposing metabolic diseases, dietary problems, abnormal habits, posture and trauma. Local factors include anomalies of tooth number (i.e. supernumerary or missing teeth), anomalies of tooth size and shape, abnormal labial frenum, along with delayed or abnormal eruption of permanent teeth. Finally, Ackerman and Proffit's classification [15] proposed three main groups; namely

i) Specific causes

ii) Genetic influences

iii) Environmental influences.

For specific causes, Ackerman and Profitt proposed disturbances in embryologic development, skeletal growth disturbances, muscle dysfunction, acromegaly and disturbances in dental development. Environmental influences include masticatory function, oral habits and respiratory pattern. These classifications exhibit the complexity and varying interdependence of both hereditary and environmental factors when discussing the etiology of malocclusion. The prevalence of malocclusion particularly among children exhibits a broad range from 39% to 93% [16-19]. This wide range reflects variations in registration of malocclusions, identifying varying degrees of malocclusions (i.e. "mild" to "severe"), age and variations among ethnic groups.

Proposed Orthodontic Diagnoses

Maxillary or Mandibular Alveolar Hypoplasia

This clinical presentation typically exhibits the appearance of lingually malpositioned roots of teeth. This is accompanied by clinical deficiency or hypoplasia of the alveolar bone in the labial/buccal area of the affected teeth. This gives the appearance of crowding when observing the clinical crowns - hence the use of old quantifying diagnostic terms of "slight", "moderate" or "severely" crowded teeth. The level of crowding severity is no longer relevant as nearly all non-skeletal cases can be treated non extraction. The specific loss of localized normal boney architecture and associated localized soft tissue inflammatory changes caused by malpositioned roots has been termed orthodontosis and orthodontitis, respectively [6].

Maxillary or Mandibular Alveolar Hyperplasia

While the etiology of tooth or dental spacing is multifactorial and can manifest via microdontia or the size of teeth along with physiologic habits such as thumb sucking and tongue thrust alveolar size is the primary factor that determines orientation of teeth. Current thought suggests that dental spacing from tongue thrust habits may be a consequence of rather than the cause of an anterior open bite [20]. The clinical presentation of this diagnosis logically is spacing of teeth especially of anterior teeth with normal architecture of the alveolar bone and normal intraboney orientation of all tooth roots. Dental spacing between anterior teeth is always seen but often times it is not seen with premolar teeth. One strong possibility for lack of spacing in premolar teeth is the function of the buccinator muscle with its proximity to the alveolar bone and dental arches as discussed in classic studies [21]. Brackets are therefore often not required for teeth exhibiting normal spacing or are in proximal contact.

Addition of Occlusal Factors

The above referenced diagnoses would also include traditional static occlusion addendums of overbite, open bite and cross-bite or under bite. The authors believe that recording molar relationship is not necessary particularly for a stable occlusion because the goal of orthodontic treatment should not be to change the molar relationship in pursuit of an arbitrary occlusal morphology. What's more important is to create a functional and esthetic result by addressing an appropriate overbite/overjet of 1 to 3 mm utilizing non-extraction therapy.

Report of Cases

Four adult patients, seen by four different providers presented for orthodontic treatment with new orthodontic diagnostic terms of maxillary and mandibular hypoplasia with localized orthodontosis and orthodontitis (Figure 1 & 2), and maxillary and mandibular hyperplasia (Figure 3 & 4) were successfully treated with the patented systems of FASTBRACES® Technologies. It is important to note that the universal orthodontic goal and accompanying treatment should be to successfully treat the biologically based diagnosis of the alveolar bone clinical morphology within a patient's natural stable occlusion and morphologic appearance. Of note is that each of the maxillary and mandibular hypoplasia cases (Figures 1 & 2) started with an Angle Class I and Class II malocclusion but treatment was successfully directed towards addressing deficiencies of the alveolar bone morphology while achieving an overbite/overjet relation of 1 to 3 mm. In similar fashion each maxillary and mandibular hyperplasia (Figures 3 & 4) started with an Angle Class I and Class III malocclusion but treatment was successfully directed towards addressing the spacing of teeth while achieving an overbite/overjet relation of 1 to 3 mm (Figure 5). Therefore, the pre and post treatment molar relationship is of no relevance and should not direct treatment. This is because the universal constant is the alveolar bone clinical morphology with treatment directed towards the alveolar bone deficiencies when present and not the molar relationships. These four cases are successful examples of non- extraction orthodontic treatment with the patented systems of FASTBRACES® Technologies which appropriately address the relevant deficiencies in the alveolar bone clinical morphology while achieving a 1 to 3 mm overbite/overjet correction, irrespective of the patient's molar relation. The authors believe the systems of FASTBRACES® Technologies induce alveolar bone remodeling by moving the tooth roots towards their natural properly erupted positions from the onset of treatment.

Discussion

The ultimate goal of orthodontic treatment is based upon the premise of improving function, dental and facial esthetics and maintaining or improving dental health. The authors therefore believe that orthodontic diagnosis should be based upon a biological constant which logically is represented by the pretreatment clinical morphology of the alveolar bone. Unfortunately, this has not been the case. From a historical perspective and dating back as far back as 1829 (Samuel S. Fitch) the clinical presentation of "crooked teeth" is not diagnosed with a biological etiology but primarily classified on the basis of static occlusion [22]. In 1899 Edward Angle [1] shaped orthodontic thinking on occlusion by maintaining that the predictability and consistency of the maxillary first molar eruption pattern was of paramount importance. This represented the fundamental underpinning of Angle's philosophy and one that has been enthusiastically acknowledged as doctrine. While modifications have been made, Angle's classification has remarkably endured for over a century with occlusion of teeth being the sole benchmark of normalcy. In 1907 Angle [23] stated that the fundamental scientific treatment goal of orthodontics is "the correction of the malocclusions of the teeth". Edward Angle based his classification of malocclusion on a small localized population sample size which lacked racial diversity. Based upon these limited observations and non-biological etiology, Angle advocated a treatment goal of obtaining an "ideal" occlusion based on a specific molar relation and accompanying straight line facial profile which was arbitrarily based on the statue of the mythical Greek God Apollo. The "ideal" occlusion defined by Angle largely consists of the universal patient attainment of a specific or Angle Class 1 molar relation irrespective of racially different patient profiles. Classification

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systems of malocclusion can best be described as a grouping of similar appearing clinical cases for the sole purpose of discussion. These classifications are not diseased based, do not represent a system of diagnosis, are not a method for assessing treatment prognosis and certainly not an appropriate way of defining treatment. They are merely social observations with treatment goals largely based on altering or even camouflaging the impact of the classified malocclusion. They are not biologically based and almost exclusively derived from observations and treatment of Caucasian patients. One would therefore even have to question the value of some cephalometric "norms" or "averages".

Figure 1A before: Orthodontic Diagnosis of Maxillary and Mandibular Hypoplasia. **Figure 1B after:** Natural occlusion achieved with an overbite /overjet relation of 1 to 3 mm. The Class I molar relation of this case was irrelevant.

Figure 2A before: Orthodontic Diagnosis of Maxillary and Mandibular Hypoplasia. **Figure 2B after:** Natural occlusion achieved with an overbite /overjet relation of 1 to 3 mm. The Class II molar relation of this case was irrelevant.

Figure 3A before: Orthodontic Diagnosis of Maxillary and Mandibular Hyperplasia. **Figure 3B after:** Natural occlusion achieved with an overbite /overjet relation of 1 to 3 mm. The Class I molar relation of this case was irrelevant.

Figure 4A before: Orthodontic Diagnosis of Maxillary and Mandibular Hyperplasia. **Figure 4B after:** Natural occlusion achieved with an overbite /overjet relation of 1 to 3 mm. The Class III molar relation of this case was irrelevant.

Figure 5: The post treatment photographs of the cases presented in Figures 1- 4 look about the same and demonstrate an overjet / overbite relationship of 1 to 3mm, irrespective of their molar relation.

A clinician should consider that the premise of treating an observed malocclusion towards an arbitrary "ideal" is a misdirection of treatment. This is problematic for a variety of reasons; one being that variations of natural profiles exist along racial lines and treatment protocols broadly intended for a Caucasian patient could cause unnecessary dentoalveolar mutilation through extraction therapy with an unfavorable change in facial profile especially if a non-Caucasian patient was only concerned about his or her esthetic of "crooked teeth". For example, African American patients exhibit a higher prevalence of bimaxillary protrusion, larger teeth and even wider faces [24-26] which manifests as a pronounced soft tissue protrusion. It is clear that an orthodontic treatment plan based upon strict adherence to attaining occlusion of a specific molar relation and with a specific facial profile is undesirable especially if an African American patient does not want to change his or her profile. Besides facial profile differences between African Americans and Caucasians there are differences among other races including Asians, American Indian or Alaska Native and Native Hawaiian or other Pacific Islander. Researchers have recognized the need to perform additional clinical analyses [27-30] to evaluate differences in order to ascertain normative values among race and ethnic groups. The authors of this paper maintain that orthodontic diagnosis and subsequent treatment planning should be based on a biologically based constant which is the pretreatment clinical morphology of the alveolar bone. The problem of using a first molar relation in orthodontic "diagnosis" is further brought into light by directly comparing it to the ADA (American Dental Association) /AAP (American Academy of Periodontology) classifications in periodontal disease. For example, an AAP class/ type III periodontal diagnosis in part means probing depths or attachment loss of 4 to 6 mm. This periodontal classification and accompanying clinical findings are universal among all patients irrespective of race or ethnicity. Treatment that follows is universal. An Angle III malocclusion is described as an abnormal anteroposterior dental discrepancy with the mesio-buccal cusp of a maxillary first molar articulating distal to the mandibular buccal groove. For a Japanese person it is more prevalent and can be considered a normal craniofacial finding compared to a Caucasian [31]. Treatment that follows is therefore not universal. We therefore propose orthodontic diagnostic terms of Maxillary or Mandibular Alveolar Hypoplasia and Maxillary or Mandibular Alveolar Hyperplasia. This creates a diagnostic and treatment philosophy which is based on accepting the patient's natural dentition within their own individual genetic morphologic appearance rather than subjective or arbitrary ideals. The amount of severity of teeth crowding or spacing is irrelevant in almost all non-skeletal cases because most treatments are typically completed non extraction. In the case of Alveolar Hypoplasia (maxillary or mandibular) treatment with the patented systems of FASTBRACES® Technologies initially addresses the characteristic non-inflammatory pattern of the alveolar bone hypoplasia known as orthodontosis which is associated with incomplete eruption and lingually malpositioned roots of teeth. Brackets and wires are placed on all teeth that are lingually displaced and exhibit alveolar bone hypoplasia / orthodontosis. These innovative systems facilitate what the authors believe to be the continuation of natural eruption or Orthoeruption [6] by inducing alveolar bone remodeling and development by moving roots toward their final naturally erupted position from the beginning of treatment. In the case of Alveolar Hyperplasia, (maxillary or mandibular) treatment with the patented systems of FASTBRACES® Technologies follows a similar sequence of attaching brackets and wires to the teeth exhibiting clinical spacing and closing of these spaces with elastic power chains. In summary, changing the molar relationship especially in a stable functional occlusion should not be the driving factor in orthodontic treatment. Rather, attention to the pretreatment alveolar clinical morphology should be the driving force of a biologically based orthodontic diagnosis along with the functional goal of 1 to 3 mm of overjet/overbite. The clinician with the appreciation of a patient follows an esthetic and functional non extraction orthodontic treatment based upon correcting or improving the alveolar bone clinical morphology by moving tooth roots from the onset of treatment thereby maintaining the patient specific natural facial morphology. Successful treatment which specifically addresses this philosophy in markedly reduced treatment times has been attained across a variety of clinical presentations with the patented systems of FASTBRACES® Technologies [20,32-36].

Conclusion

Proposing orthodontic diagnostic terms based upon the pretreatment clinical morphology of the alveolar bone fulfills several important considerations. This includes utilizing the biologically based constant of alveolar bone rather than reproducing an arbitrary "ideal" occlusion which conforms to a molar relation derived from observation of static occlusion which occurs approximately 15 to 30 minutes per day. This only represents a static glimpse of a 24-hour cycle of dynamic occlusal function. Utilizing clinical morphology of the alveolar bone logically follows into universal orthodontic treatment which accepts a patient's natural morphologic appearance and stable occlusion irrespective of molar relationships towards an improved alveolar morphology by moving malpositioned tooth roots from the onset of treatment thereby inducing alveolar bone remodeling and development.

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