Accelerated orthodontics through micro-osteoperforation

Dr. Jonathan L. Nicozisis explains a new micro-invasive technique

Patients' number one concern before starting orthodontic treatment is how long treatment will take. In the past 20 years, new devices and modalities have made the orthodontic process more efficient, but not faster. Many innovations have been introduced to improve bracket design and treatment protocols; however, the only effective techniques to increase the speed in which teeth move through alveolar bone involve extensive surgery.

The challenge has been how to locally accelerate bone remodeling in a non-invasive manner.

Treixeira, et al., has shown that biological principles can be activated to accelerate bone remodeling using micro-osteoperforations (MOP). In particular, by increasing the local levels of cytokine activity around a tooth, the rate of tooth movement during orthodontic therapy can be increased.[1] Increased cytokine activity has been well documented to increase bone remodeling. In animal studies[1] when clinicians create micro-osteoperforations in the alveolar bone, the cytokine cascade is activated, resulting in a marked increase in osteoclast activity. When any type of orthodontic force is applied immediately following micro-osteoperforation, the teeth will move easily through the treated area (Figure 1).[1]

Micro-osteoperforation (MOP) is the only micro-invasive option able to accelerate orthodontics. MOP creates predictable orthodontic treatment results, improves finishes with braces, and reduces or eliminates refinements with clear aligner therapy. MOP can be completed chairside in minutes, and does not require any advanced training; therefore, any trained clinician can perform it. Additionally, the treatment yields very little discomfort to the patient. There is zero recovery time, and the patients are able to immediately return to their normal daily routine. The procedure is indicated for approximately 80% of patients receiving orthodontic treatment and can be used in conjunction with any treatment modality, including but not limited to, TADs, Invisalign® (Align Technology), SureSmile® (OraMetrix), and conventional braces.

The ideal treatment device for micro-osteoperforation should be able to provide ergonomic control by the using clinician, and remain sharp through multiple perforations, and have a depth limiter to ensure penetration to the minimal effective depth. Temporary anchorage devices, mini-plants, and burs are not viable alternatives to performing micro-osteoperforation in a private practice setting. Recently, a new device by PROPEL Orthodontics has become available which seems to show promise (Figure 2).

Studies at major universities have been conducted with devices that demonstrated the feasibility and predictability of MOP being used chairside.[2]

Today, increasing numbers of adults are seeking orthodontic treatment to enhance the social, psychological, and functional status of their lives. Treatment of these patients is complicated by the fact that the correction of their malocclusion, orthodontically, is limited to the dentoalveolar element, since adult patients have no growth and development. With an increase in age, tissues are less biologically active, and the ability to adapt diminishes. As a result, tooth movement may not only be more uncomfortable for adults but also move at a slower rate.[3]

Previous animal studies demonstrate that by delivering micro-osteoperforation in the bone near the teeth, bone remodeling enables a greater rate of tooth movement.[3] Based on the referenced animal studies, it was demonstrated that this highly invasive surgical procedure can be simplified and replaced with minimal, shallow, small micro-osteoperforations in alveolar bone without the need for soft tissue flaps, bone grafting, or any suturing.[4]

As with any medical intervention, the longer treatment takes, the higher the possibility for side effects and poor outcomes. By shortening treatment time

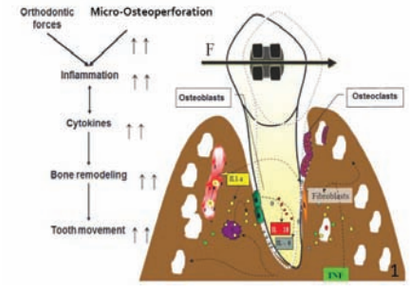

Figure 1

Figure 2

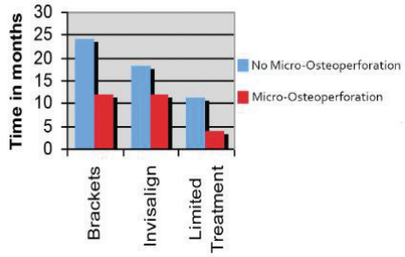

Figure 3

Jonathan Nicozisis, DMD, MS, has been in the specialty practice of orthodontics since 1997. He completed his dental education at the University of Pennsylvania before attending Temple University for his orthodontic residency. While at Temple University, Dr. Nicozisis received his specialty certificate in orthodontics and a master's degree in oral biology. During his training, he also completed an externship at the Lancaster Cleft Palate Clinic in Lancaster, Pennsylvania, where he was involved with the care of patients with craniofacial syndromes. Dr. Nicozisis is a member of Invisalign® National Speaker's Bureau and Clinical Research Network where he helps conduct research and development of new technologies and improvements to the Invisalign technique. Dr. Nicozisis is also the founding orthodontist and a scientific advisory board member of BAS Medical (now Corthera), a development-stage company founded in 2003 with a mission to develop and market a novel technology to accelerate and improve the stability of orthodontic treatments. Dr. Nicozisis' master's research is the basis for BAS Medical innovative research. In February of 2010, Corthera was acquired by Novartis. Dr. Nicozisis has been awarded membership to the Edward H. Angle Society of Orthodontists. He is a member of the American Association of Orthodontists, Middle Atlantic Society of Orthodontists, New Jersey Dental Association, Mercer County Dental Society and the Greater Philadelphia Society of Orthodontists. Dr. Nicozisis is a paid lecturer, but not a consultant, for PROPEL Orthodontics.

Clinical examples of micro-osteoperforations

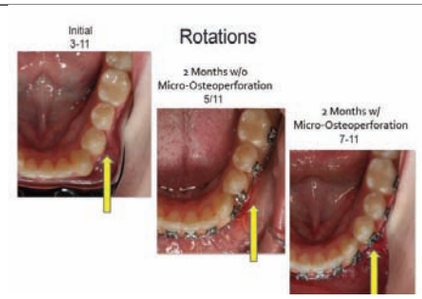

Figure 4: LL 4 and 5 were treated for 8 weeks w/o MOP with little correction. MOP was performed and correction was completed in 8 weeks

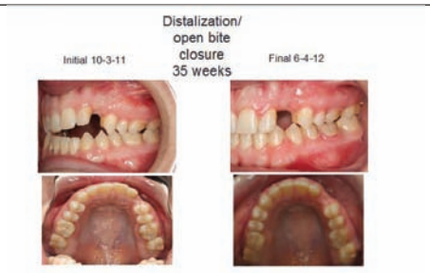

Figure 5: MOP was performed and correction of open bite was completed in 35 weeks

Figure 6: Significant leveling and aligning of the maxillary anterior segment in 4 weeks

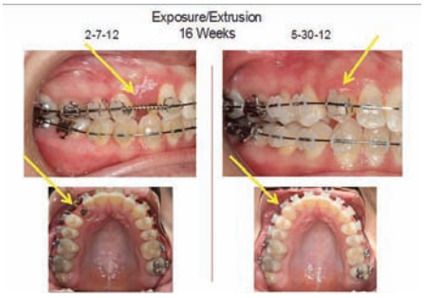

Figure 7: MOP was performed and extrusion was completed in 16 weeks

with MOP, patients avoid the pervasive complications of long-term orthodontic treatment. There is less likelihood for decalcifications due to extended banding times leading to "white lesions." Root blunting is reduced, as treatment duration is shortened.[5] Shorter treatment time will allow patients to return to their normal oral hygiene routine and maintain clean teeth.

Clinical examples of micro-osteoperforations

LL 4 and 5 were treated for 8 weeks without MOP with little correction. MOP was performed, and correction was completed in 8 weeks.

Significant leveling and aligning of the maxillary anterior segment.

Micro-osteoperforation's clinical uses

- Molar uprighting
- Lower anterior crowding
- Canine impactions
- Forced eruption
- Difficult aligner movements
- Space closing
- Rotations
- Intrusion
- Correction of Curve of Spee
- Pre-surgical orthodontics
- Pre-esthetic (prosthetic) orthodontics
- Avoid surgical intervention

A rapidly growing segment of the orthodontic market is adult relapse cases. This population of patients' chief complaint is often lower anterior crowding. MOP is uniquely able to quickly address this issue and help this population of patients achieve their desired result quickly without the need for long term treatment.

Besides the orthodontic and tooth position issues, accelerating treatment will allow adults and teens with busy schedules and limited time for long term treatment with multiple appointments the option of orthodontic care. Micro-osteoperforation makes orthodontic treatment a realistic option for many that up until now could not commit to extended treatment.

Micro-osteoperforation harnesses the body's own biology to create a cytokine effect that induces bone remodeling and allows teeth to be moved into the clinically desired position in a more predictable and faster manner. The induction of the cytokine cascade is modulated and controlled by the design of the device itself. Basic bone biology research, animal studies and controlled clinical trials have demonstrated the safety and efficacy of the MOP treatment.[6]

In fact, the results of both animal and clinical studies have demonstrated that micro-osteoperforation decreases orthodontic treatment in combination with any type of orthodontic force (Figure 3).[2]

There are multiple benefits of using the MOP in the office including reducing treatment time, economic benefits, and greater patient satisfaction with orthodontic treatment.

Reducing treatment time for patients has been an industry goal due to patient and orthodontist demand. Besides the cost of treatment, patients take time from work and school to attend multiple appointments. These appointments incur significant indirect costs. The average patient spends an additional $654 dollars travelling to and from their appointments during a 2-year treatment.[7] Reducing the number of these multiple office visits will save both time and money.

Orthodontists are looking for ways to efficiently treat more patients. Finishing cases faster and with more predictability will allow a larger percentage of the population to be treated. There is currently a shortage of orthodontists, which is only predicted to worsen in the next 20 years.[8]

Adult patients exhibit a greater incidence of mutilated dentitions with missing teeth. As these adult patients seek prosthodontic treatment, a cost-effective option to implants often involves orthodontic closure of the edentulous region. Adult patients do not want orthodontic treatment for an extended period of time. Micro-osteoperforations can significantly shorten the duration of treatment, making orthodontics a more acceptable option. OP

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