Accelerated Orthodontics:

The Power of Predictability

by David S. Eshom, DDS

David S. Eshom, DDS, is a general dentist who emphasizes dental health and beauty via minimally invasive techniques and high-tech equipment for patients. His private practice in San Diego, California, has received a national award for being "cosmetic practice of the year." He is both a credentialed cosmetic dentist and a "Top 1%" Elite Invisalign provider. Eshom received his undergraduate degree in business and his DDS from the University of Pacific. He has published articles about and lectures internationally on Invisalign, cosmetics and laser dentistry.

Course description

This course reviews the roles of manual osteoperforation and high-frequency vibration seating devices on bone remodeling and tooth movement.

Abstract

Two main obstacles stand in the way of patient acceptance: cost and treatment time. This course will review how manual osteoperforation (MOP) and high-frequency vibration seating devices can be used to help speed up treatment time.

Learning objectives

After completing this course, the reader should be able to:

- Understand how manual osteoperforation (MOP) facilitates the more rapid movement of teeth.
- Recognize the average recommended depths and locations for MOPs, based on individual anatomy.
- Be familiar with the MOP treatment procedure.
- Understand how high-frequency vibration seating devices can facilitate programmed delivery forces of clear aligners.
- Understand the differences between high-frequency and low-frequency vibration devices.

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Introduction

In presenting orthodontic treatment plans, two main obstacles stand in the way of patient acceptance: cost and treatment time. Manual osteoperforation (MOP) offers a simple, cost-effective and time-saving option for orthodontic patients of any modality. In addition to MOPs, for clear-aligner patients, a device that utilizes high-frequency vibration can be used for more efficient aligner seating; and as a result, patients potentially can spend less time in each aligner.

Cost will always be a factor for patients faced with decisions about orthodontic treatment, but time can be on the dentist's side, whether he or she uses manual osteoperforation alone or in conjunction with vibration for aligner seating.

How manual osteoperforation works

Manual osteoperforation drivers make microfractures in the alveolar bone between roots, causing an inflammatory reaction and a release of cytokines. This biological response facilitates faster remodeling of osseous cells and is believed to allow teeth to move more rapidly.

At NYU, a team of doctors including Drs. Mani Alikhani and Cristina Teixeira conducted research with a manual osteoperforation instrument and observed that teeth can move faster using the microfracture technique achieved with the manual osteoperforation instrument and methodology.[1]

The family of MOP includes a disposable device, a manual handle with replaceable tips and the power driver. I often use the replaceable tip driver which comprises of a handle and a strategically crafted screw tip, fitted with a retracting plastic sleeve that indicates depth at 3, 5 and 7 millimeters. The genius in the method is creating microfractures which facilitate faster remodeling of bone for what is said to reach up to 10mm, which covers more than enough space for rapid tooth movement.

Recommended depth for MOPs differs depending upon individual anatomy, and may vary based on thickness of the gingiva and alveolar bone. The following are some suggested depths as a general guide: (Recommendations are a starting point for case consideration and based on my practice experience.)

Where to perforate	
Mesiodistal	• Typically interproximal to targeted teeth.
Buccolingual	• Typically buccal approach. • Lingual for palatally impacted teeth.
Crestal-apical	• Stay crestal of apex. • Stay 3mm apical of crest. • As anatomy permits.
Maxillary vs. Mandibular	• Indicated for either.
Anatomical contraindications	• Avoid roots, mandibular nerve, frenum, greater palatal artery and maxillary sinuses.
Other	• Braces • No perforations mesial or distal to anchorage (including TADs)

Maxillary

- Typically, 3mm is sufficient for entire arch.
- Molars may require 5mm, based on tissue depth.
- Palatal perforation may require 5–7mm (i.e., thick gingival tissue).

Mandibular

- Typically, 3mm is sufficient mesial of canines.
- Typically, 5mm distal of canines.

After the patient is prepped by an assistant, the doctor evaluates the root angle via X-rays, anesthetizes with BTT topical or local infiltration, positions the tip between the roots, and turns the handle clockwise while applying pressure until the tip reaches the appropriate depth. The flexibility of the depth gauge on the tip allows the operator to move from enhancing molar movement with a 7mm depth to lower anterior roots with a 3mm microperforation—all without changing the tip. You can treat a tipped cuspid, a rotated

upper lateral or a molar crossbite all on the same patient with the same tip and handle. The application time lasts roughly 15–20 minutes, including postoperative instructions. The patient may experience mild localized tenderness for 12–24 hours afterward, for which I recommend acetaminophen.

Manual osteoperforation may also offer additional benefits to treatment and practice management. I've found that difficult tooth movements proceed more predictably after using MOP. Intrusion, stubborn upper laterals or rotated cuspids move more predictably.[1] Fewer appointments lead to increased profitably and allow the practice to manage these orthodontic patients more efficiently, improving overall practice management. Patient compliance is better because there are fewer appointments, which means the patient is less likely to get "burned out" with 18- to 36-month treatment times. Since MOP is doctor-controlled, patients don't need to do anything at home. Compliance in this respect is 100 percent.

High-frequency vibration for added predictability

In addition to manual osteoperforation, or for patients for whom MOP is not appropriate, a patient-controlled, high-frequency vibration seating device may be a good option during clear-aligner treatment. Aligners must be seated tightly over the teeth for the orthodontic forces to express in the intended and very specific way. The device, which the patient wears for only 5 minutes a day, vibrates at 120 hertz (cycles per second), allowing the aligner to be more efficiently seated. As a result, treatment can be completed more quickly because the patient won't have to backtrack to previous trays and the dentist may be able to eliminate refinements that take up treatment time. (Poorly fitting aligners also can result in teeth moving in an unintended direction, which is never a welcome occurrence.) Often times, patients can potentially spend less time in each aligner, so treatment can be completed more quickly.

The device is easy for patients to use and helps them to feel more involved and compliant regarding their treatment outcomes. Also, because patients know that the clinician can plug in the device to obtain their usage information at each appointment, they feel more accountable for how quickly their orthodontic treatment will be completed. Aligner seating with vibration is an effective compliment to clear aligner therapy.

Fig. 1: Initial treatment photos

Manual osteoperforation-treated case results

Helping patients become healthier and more aesthetically pleasing with orthodontics is what we do. Doing it in half the time offers tremendous patient benefits. Whether it's because of an upcoming wedding, graduation, reunion or travel, treatment time that's been cut in half will be appreciated and valued by patients, which will weigh heavily on their decision to proceed with treatment.

The patient in this case study wanted to propose marriage to his girlfriend, but first wanted a better smile without the embarrassment of "gapped" teeth. He had Class I malocclusion with spacing, 3mm upper spacing and 4mm lower spacing. The expected treatment time without manual osteoperforation was 12 months. The actual treatment time with manual osteoperforation

Disclosure:
The author declares that he has a financial arrangement or affiliation with Propel Orthodontics offering financial support or grant monies for this continuing dental education program.

Fig. 2: Number of trays: 20 upper, 14 lower.

Fig. 3: Post-treatment photos, with successful space closure four months after manual osteoperforation.

was 4 months. He was very appreciative of the opportunity to propose even sooner than hoped!

Summary

Having patients accept treatment is a necessary first step for every practice. After finances, treatment time is the biggest hurdle to a patient proceeding. MOP and high-frequency vibration allow orthodontists to offer the huge benefit of cutting treatment time. Adding it to your orthodontic treatments rewards both doctor and patients, and could help your practice stand out from the competition. ■

This article may describe uses of osteoperforation in general and/or an Excellerator series driver specifically that have not received 510(k)-clearance or premarket approval from FDA. Propel Orthodontics markets the VPro5 as a high frequency vibration aligner seater. This article may describe uses of high frequency vibration technology in general and/or the VPro5 specifically that are outside of our labeling.

References

1. Alikhani M, Raptis M, Zoldan B, Sangsuwon C, Lee YB, Alyami B, Corpodian C, Barrera LM, Alansari S, Khoo E, Teixeira C. Effect of micro-osteoperforations on the rate of tooth movement. Am J Orthod Dentofacial Orthop. 2013;144(5):639-648.
2. Alikhani M, Khoo E, Alyami B, Raptis M, Salgueiro JM, Oliveira SM, Boskey A, Teixeira CC. Osteogenic effect of high-frequency acceleration on alveolar bone. J Dent Res. 2012;91(4):413-419.

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1. Local infiltration anesthesia must be used with manual osteoperforation.
- A) True
- B) False

2. _____ drivers create "microfractures" in the alveolar bone between roots, thereby causing an inflammatory reaction and a release of cytokines.
- A) Biology
- B) Manual osteoperforation
- C) Root
- D) None of the above

3. Recommended depth for the manual osteoperforations differs depending upon individual anatomy, and depth may vary based on thickness of the gingiva and alveolar bone.
- A) True
- B) False

4. Patients may experience some tenderness around the treatment site for ____ .
- A) 24–48 hours
- B) 4-5 days
- C) 7-10 days
- D) Up to 30 days

5. Local infiltration anesthesia must be used with manual osteoperforation.
- A) True
- B) False

6. The high-frequency vibration seating device, which the patient wears for only 5 minutes each day, vibrates at _____hertz, allowing the aligner to be more efficiently seated.
- A) 35
- B) 90
- C) 120
- D) 150

7. Aligner seating with vibration ___.
- A) Is patient controlled
- B) Is doctor controlled
- C) Is invasive surgery
- D) None of above

8. The patient presented with ____.
- A) Impacted canines
- B) Deep bite
- C) Class I spacing
- D) Exposed canine

9. Patients space closed in _____ after manual osteoperforation.
- A) 14 days
- B) 2 months
- C) 4 months
- D) None of the above

10. Poorly fitted aligners can result in:
- A) Unintended movements
- B) More comfort
- C) Fewer refinements
- D) All of the above

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