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Comparison of Efficiency of two devices on Accelerated Orthodontic tooth movements – A review

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ABSTRACT: In this study, two devices, which are used for accelerated orthodontic tooth movement are compared, based on working principle, advantages and disadvantages. Both these devices act as ideal accessories in enhancing faster movement of teeth

I. INTRODUCTION

With the newer innovation in Accelerated Orthodontics[1], the treatment duration of traditional braces or aligners is bound to reduce, enabling the patient with more stable results in lower time. Faster Orthodontic treatment is possible using these two newer devices namely Acceledent and Propel. They tend to complete orthodontic treatment procedures as much as half the time.

II. OBSERVATION

In this study we are going to see about working principle, advantages and disadvantages of these two devices in fastening orthodontic treatment time when used along with aligners as well as traditional braces.

PROPEL ACCELODENT

The search for accelerated tooth movement in orthodontics has been a "Holy grail" of sorts for both orthodontist as well as patients.In the past few years, a significant increase in the number of modalities has become available to accelerate teeth movement. All these techniques are reported to induce bone remodelling and increase cytokine activity. They include injections and surgical stimuli to vibrational therapy and even the use of Photobiomodulation (PBM). In combination of light orthodontic forces, all of these modalities have created interest and a debate as to which is the most effective.

Accelerating tooth movement is not a new concept, in the 1970's Wilcodontics now known as Accelerated Osteogenic Orthodontics (AOO) was developed as a surgical technique to accelerate tooth movement "Piezocision" is another surgical procedure, but a major drawback of both of these is that they are invasive and can involve significant postoperative discomfort and additional follow-up visits. In an effort to find a less invasive procedure, these systems Acceledent and Propel have been introduced. These devices employ vibration or low-level light to accelerate orthodontic treatment namely Acceledent, Ortho-Accel technologies and VPro5, Propel Orthodontics and systems like Ortho Pulse, works on Light Stimulation Principle.

Acceledent, is one such advancements in non-invasive modalities widely accepted by patients to accelerate tooth movement and works on vibrational therapy. It has been shown to enhance bone remodelling and has been demonstrated to help seat clear aligners as well as traditional braces. It increases blood flow to teeth thereby decreasing pain. This vibrational therapy is extremely effective in expediting molar intrusions and open bite patients, as these patients have weaker muscles of mastication and vibrational therapy helps to seat the aligners and intrude the posterior teeth.

Advantages:
1. Safe and effective,
2. Reduce discomfort associated with orthodontics,
3. Light weight and easy to use,

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Disadvantages:
1.Patient compliance is necessary.
Another system which enables less invasive procedure is Propel, has been developed using single use screws to make manual perforations [2]. Initially, A local anaesthetic is applied on gingiva and propel is used for making micro osteo perforations[3] directly through the keratinized gingiva and mucosa, thereby increasing cytokine activity leading to increase in bone remodelling. This leads to shortening of treatment time and makes difficult tooth movements easier and more predictable.

Advantages:
1.Orthodontic treatment time can be reduced to half,
2. Beneficial for development of alveolar bone as it stimulates growth,
3.Effective, Comfortable and safe procedure.
Disadvantages:
1.Slightly expensive and
2.Only performed in clinics by an orthodontist.

ACCELEDENT

The technology behind Acceledent is predicated on the application of pulsatile forces to move teeth faster by accelerating the bone remodelling process.(1)A study conducted by Dr.Jeremy Mao in vivo on animals in early 2000's at University of Fllinois, Chicago served as foundation for the scientific understanding and technology development of Acceledent. Overtime, subsequent studies have been published on accelerated bone remodelling and pulsatile forces in a variety of animal models and they have shed light on the biological response at the cellular level.

Working principle of Acceledent

Acceledent is an adjunctive therapy that's combined with regular orthodontic treatment including metal braces, clear braces and Invisalign. It is a portable, removable, hands-free braces accessory. It consists of a mouth piece which is connected to an activator [4]. It gently vibrates using patterned soft pulse technology, which is said to exert even less force than an electric toothbrush and over 200 times less force than regular chewing[5]. The micro pulses speed up tooth movement and increase the rate of bone remodelling compared to constant, static pressure. A study published in the journal of clinical orthodontics found that levelling phase [6] which is usually around seven months was reduced to approximately five months, when acceledent was used.

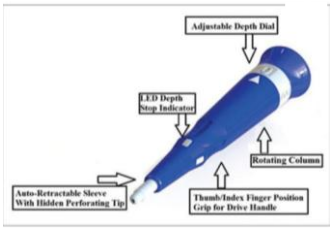
How to use Acceledent

It is very easy to use, you must attach, the mouth piece by plugging it into the activator, once it's on, you can see the LED light is green, then we have to place in mouth, bite down firmly to hold it in place and make sure there is contact on all sides of the mouth piece. Must not hold it with hands. It can be paused for five minutes during procedure. The total time is 20 minutes. After this time, one has to reset. Therefore, you have to use it for 20 minutes daily, and using it more than 20 minutes daily is not recommended and will not enhance the results. Always ensure you keep it charged. The LED indicator will quickly flash orange light when it's time to recharge. Use power adapter or connect it to computer USB and recharge.

Cleaning instructions: Mouth piece should be removed from the activator and then should be cleaned. Rinse mouthpiece after each session with lukewarm water and once in a while, brush it with toothpaste or mild soap or liquid, and wipe it properly to ensure that it is not wet.

PROPEL

Propel is used by an orthodontist, it is a chairside procedure whereas Acceledent is used by patient themselves at home and outside dental clinics.



This device is used to make Micro-osteoperforations (MOP's), that are a size of pinhole in the bone around the teeth. They encourage a natural inflammatory response, which stimulates the release of cells involved in breakdown of bone, thereby enabling bone remodelling and accelerating tooth movement. A study in American Journal of orthodontic and Dentofacial orthopaedics found that MOP's increase the rate of tooth movement by more than

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twofold and thereby reduce treatment time by up to 62%. The authors of another study in AJODO noted that Propel was an effective, comfortable and safe procedure that accelerates tooth movement significantly.

Working principle of Propel

The Propel system[7] introduces and creates alveolar perforations to make orthodontic movements more efficient. By creating these micro perforations, bone production is stimulated and faster tooth movement occurs. More effective when used in young adults.

After evaluating the size of gaps through X-ray in between teeth, local anaesthesia is applied to ensure no discomfort. Each tooth, that is going to be moved will have one to three holes made on each side of the tooth. These tiny holes are made through gingiva and into underlying bone. It can be used both with traditional bracers as well as aligners.

After this procedure, there is zero recovery time. Only these few steps must be taken. Firstly, patient will have sensitivity for few hours, which will gradually suppress [8]. Anti-inflammatory drugs must be avoided as inflammation is good thing and Propel works on this very principle. Avoid taking spicy foods. While the micro perforations are healing, swishing with diluted hydrogen peroxide two to three times a day is necessary.

Acceledent versus Propel

Both are two popular devices in the world of accelerated orthodontics [9]. Faster tooth movements can be enabled, and as a result treatment can be completed at faster duration. The only difference being, Acceledent which works on vibration is used by the patient outside office, anywhere at home, so patient compliance is necessary. whereas Propel works on pulsatile [10,11] forces and can only be used by an orthodontist in office, ensuring maximum effectiveness of these procedures.

III. CONCLUSION

Acceledent and Propel devices are both effective ways to speed up orthodontic treatment. Both these devices are patient friendly [12,13], minimally invasive and enable to reduce the total duration of orthodontic treatment. Both these devices can be used with regular traditional systems, Clear braces and as well as Aligners. MOP's have clinically shown to increase the rate of tooth movement [14] and decrease the treatment time by 35% to 40% and has no analgesic effect and also requires no patient compliance. Whereas low frequency vibration can reduce treatment time by as much as 35% to 40% but offers analgesic effect and patient compliance is needed.

Completing orthodontic treatment early, with lesser visits, and with more predictable results are compelling reasons to introduce AO into once routine orthodontic practices to enable faster orthodontic treatments.

Conflicts of Interest

There are no conflicts of interest.

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