INTRODUCTION

The orthodontic patient's number one concern has always been “how long will I have to wear the braces for?” Recent developments in the field of orthodontics have made it possible to increase the speed and efficiency of orthodontic tooth movement such that there is a dramatic decrease in treatment time. Various pharmaceutical, surgical, mechanical/physical simulation methods have been utilized in an attempt to enhance the periodontium’s response to orthodontic forces, and subsequently accelerate tooth movement.

BIOLOGICAL APPROACH

As of now, no biologically active molecule exists that can safely accelerate tooth movement without causing side effects. Systemic delivery results in unwanted systemic adverse effects. Local delivery requires repeated painful injections of the biologically active molecule.

ADVERSE EFFECTS

PHYSICAL/MECHANICAL STIMULATION

Cyclic forces/vibrations

The use of resonance vibration to accelerate orthodontic tooth movement in humans (Kau et al)

Low Level Laser Therapy (LLLT) - Photobiomodulation

The results of human studies conducted to study effect of Low Level Laser Therapy on orthodontic tooth movement (Cruz et al, 2004)

Light Accelerated Orthodontics

FDA approved device which uses low intensity near infra-red light (850 nm continuous wavelength) technology to accelerate tooth movement by a factor of 2-2.99 times (Kau et al, 2013), thereby reducing treatment time.

CONCLUSION

The administration of certain exogenous biological molecules during animal experiments and clinical trials, to accelerate orthodontic tooth movement, has shown promising results. However, at present, there is no exogenous biological molecule that can be safely administered without causing any adverse effects on systemic or local application, thereby limiting the scope of future research via human trials, until a safer alternative can be developed.

The low level laser therapy, as one of the mechanical methods to increase the rate of orthodontic tooth movement, has shown the most favorable outcome. Although, further investigations are warranted in order to determine the optimum energy level and duration of therapy at which higher success rates can be achieved.

Orthocytosis assisted orthodontics still remains the most predictable method of speeding up orthodontic tooth movement, however, due to its aggressiveness, its clinical application has been limited. Developments and modifications to this approach, has given rise to less invasive techniques, such as the recent introduction of piezocision, which clinically, has resulted in better periodontal tissue response and esthetics.

Further clinical research is necessary in order to safely endorse a particular method of accelerating orthodontic tooth movement. However, the way has been paved forward for this new frontier in orthodontics, which will not only reduce the duration of treatment, but also will decrease the predisposition to dental caries, gingival recession and root resorption during orthodontic treatment, which are some of the disadvantages posed by current treatment times.

BIBLIOGRAPHY

3. Hassan A. TODENTJ. 2010;4(1):159-164
11. Mani Alikhani (2013)

SURGICALLY ASSISTED ORTHODONTICS

Corticotomy facilitated orthodontics enables treatment to be completed in 1/3 to 1/4 the time required for traditional orthodontics (Wilcko et al, 2009)

Rationale

Physical injury evokes a regional acceleratory phenomenon which results in temporary osteopenia responsible for the rapid tooth movement. (Dibart et al, 2010)

Corticotomy assisted orthodontics - Periodontally accelerated osteogenic orthodontics

- Involves the decortication of bone adjacent to malposed teeth (without entering cancellous bone) using slow speed burs and irrigation, and particulate grafting if required in areas that have undergone corticotomy.

- Heavy orthodontic forces can be applied 1 week before to 2 weeks after surgery.

- Can reduce orthodontic treatment time by 75%, as well as increase the alveolar process width.

Indications and Clinical Applications

1. Resolve crowding and shorten treatment time
2. Accelerate canine retraction after premolar extraction
3. Enhance post-orthodontic stability
4. Facilitate eruption of impacted teeth
5. Facilitate slow orthodontic expansion
6. Molar intrusion and Open Bite correction
7. Manipulation of Anchorages

Complications and Adverse Effects

• Invasive
• Periodontal defects, slight interdental bone loss and loss of attached gingiva
• Some post-operative swelling and pain
• G. Some post-operative swelling and pain
• Intensive corticotomies may result in subcutaneous hematomas of the face & neck

Not suitable for patients with active periodontal disease/gingival recession

Flapless corticotomy - Corticion

Involves the use of a reinforced scalpel and mallet to go through the gingiva and cortical bone without raising a flap buccally and lingually.

Drawbacks:

• Not able to graft soft/hard tissues during the procedure to correct inadequacies and reinforce periodontium
• Repeated malleting can result in dizziness, foreign paroxysmal positional vertigo post-surgery

Patients find the procedure quite aggressive.

Laser assisted flapless corticotomy

Laser assisted flapless corticotomy can enhance orthodontic tooth movement without jeopardizing the healing process of the soft tissue and the hard tissue.

The effects of laser assisted flapless corticotomy on the rate of orthodontic tooth movement (Massoud et al, 2012)

Piezocision (Minimally invasive procedure)

- Flapless corticotomy using buccally placed micro-oscillators and the use of a piezoelectric knife. Selective tunneling is also possible for soft/hard tissue grafting, if required, making it quite versatile.

- It demonstrates similar clinical outcome when compared to classic decortication approach but has the added advantages of being quick, minimally invasive, and loss traumatic to the patient.

- It takes typically 1 hour to complete both arches as compared to 3 to 4 hours with earlier methods.

- The effect of piezocision can extend to 1.5 teeth from each side of the surgical site, therefore decorticating every other tooth is a viable option.

Micro osteo perforations (alveocentesis)

- Micro-osteoperforation is an effective, comfortable, and safe procedure to accelerate tooth movement and significantly reduce the duration of orthodontic treatment.

- Not as invasive as corticotomy with flap elevations or even microincisions.

- A ready-to-use sterile disposable device is used to place 2-3 micro perforations placed between each tooth in the cortical bone through the gingival tissue.

- This procedure can significantly increase the rate of orthodontic tooth movement by up to 2-3 fold, without causing any significant pain or discomfort during or after the procedure, or any other complications.